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To Professor Fiedmann

with the author's kind regards

LECTURES

ON

THE MORBID ANATOMY

OF THE

SEROUS AND MUCOUS MEMBRANES.

IN TWO VOLUMES.

BY

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THE SOCIETY OF MEDICAL AND NATURAL SCIENCES OF BRUSSELS,
THE MEDICAL SOCIETY OF GHENT,
THE SOCIETY OF NATURAL PHILOSOPHY AND MEDICINE OF HEIDELBERG,
THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA,
THE MASSACHUSETTS' MEDICAL SOCIETY, THE GEOENIAN SOCIETY OF CATANEA,
THE IATROPHYSICAL SOCIETY OF PALERMO, THE SANDWICH ISLANDS' INSTITUTE, &c.
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TO MY FRIENDS,

THOMAS BELL, F.R.S. & L.S.

PROFESSOR OF ZOOLOGY IN KING'S COLLEGE, LONDON; AND CONSULTING

SURGEON-DENTIST TO GUY'S HOSPITAL:

AND

JOHN MORGAN, F.L.S.

SURGEON AND LECTURER ON SURGERY AT GUY'S HOSPITAL.

DEAR FRIENDS,

I cannot forego the gratification of offering you this Volume as a small tribute to your highly-valued friendship; which, having contributed largely to my advantage and enjoyment, during the several years of my connection with the Institution in which these Lectures were delivered, continues, with undiminished value, to survive my separation from it.

Scilicet ut fulvum spectatur in ignibus aurum,
Tempore sic duro est inspicienda fides.

With best wishes for your happiness,

I am your obliged and attached friend,

THOMAS HODGKIN.

I should not do justice to my feelings, did I not here acknowledge my grateful sense of the kind and respectful attention uniformly exhibited towards me by the Students of Guy's Hospital, in whose service these Lectures were composed; and in whose welfare I continue to feel a warm and deep interest.

Lower Brook Street, Grosvenor Square,
17.8.1840.



PREFACE.

So long a period of time has elapsed since the publication of the First Volume of these Lectures, that some explanation seems called for, on now bringing out the Second.—Two causes have produced this delay. A portion of the present volume was already in the press, when a serious interruption to my health arrested its progress. This suspension was quickly followed by my unexpected separation from the Institution in which my Lectures had been delivered: and this circumstance not merely removed one of the inducements to publication, but deprived me of many of the materials which I had collected, and on which I relied for consultation in the completion of the work. The major part of the Lectures had indeed been written out at length; but in each Lecture there were spaces, in filling up which, I had been accustomed to depend on the Preparations, as texts. These spaces I have now had to complete from other sources, with the aid of a brief manuscript syllabus, which I had preserved. The circumstance to which I have alluded, likewise prevents the illustration of the Lectures by so complete a reference to Preparations in the Museum as I designed in my original plan: but I hope to make some compensation for this omission, by reference to other Collections, which I have been allowed to inspect.

In the course of the preparation of this volume, various important points have come to my knowledge; partly in consequence of the progress of Science, and the publication of new works; and partly from other sources, which, though previously existing, had not been fully consulted. Some of these materials have been introduced, with due notice, in the course of these Lectures: but with regard to other points, I reserve them for appended Notes, which I intend to publish in a third volume, which will be required by the remaining Lectures on the Mucous Membranes.

The termination of the Small Intestines appears to offer a suitable point at which the subject may be arrested. In order to complete the series of twelve articles, I have given, as the concluding one, a short Paper, not originally designed for a Lecture, yet calculated to facilitate the comprehension of some of the views advanced in the eleventh.

In the course of the Lectures contained in this volume, I have allowed myself to be drawn into further digression, with reference to opinions, than was the case in the twelve preceding Lectures; but I trust that this circumstance will neither render the work more tedious to the reader, nor impair its value, as a record of facts carefully observed and studiously arranged.

In bringing this volume through the press, I have been deprived of the valuable assistance of my excellent friend, JOHN BLACKBURN, whose important services I had gratefully to acknowledge, in reference to the first. After having been for a short time usefully and honourably engaged in the practice of his profession at Liverpool, he was attacked with most alarming symptoms of pulmonary disease. Residence in a warmer climate than our own appearing to offer the only means of prolonging his valuable life, he passed

several months in the neighbourhood of Rio Janeiro ; where his health, though not restored, was considerably improved. —Whilst the concluding pages of this volume have been in the Printer's hands, the melancholy intelligence has arrived, that he was lost, with his brother, who accompanied him, during a storm, in the Gulf of Florida, on his return to this country.—In his death, the Medical Profession has lost one of its most promising members: and I trust that I shall be excused, if, with the feelings of bereaved friendship, I offer a feeble testimony to his merits; which, though unavailing to himself, may serve both as a stimulus and a warning to others. Having distinguished himself at Glasgow, by obtaining several prizes, as well as taking the degree of Master of Arts with the highest honours, he became a student of Guy's Hospital, with all the advantages of cultivated talents and great ardour. He gained the first prizes; performed the office of Clinical Clerk with great credit; was an able supporter of the Physical Society; contributed an elaborate and important article, "on the Excision of Joints," to the Hospital Reports; and conferred a most important benefit on the School attached to the Hospital, in establishing and organizing amongst its Pupils the Clinical Society for the observation and record of Cases. The need of such an Association I had long felt and endeavoured to enforce; but without success, until my friend, JOHN BLACKBURN, received and carried out the suggestion. It is to be feared, that these exertions, in conjunction with close attention to dissection and inspections, may have originated the disease, which, aggravated by professional and literary labours, rendered it necessary for him to seek another climate, in which his valuable life has met with so melancholy a termination. —Whilst engaged as a student at the Hospital, he was accustomed to look forward with pleasure to the time when he might promote the interests of the Medical Institutions

of his native town. Though these anticipations cannot be realized, it is to be hoped that his professional brethren will not allow the force of so bright an example to be merely transient.

I must not omit to acknowledge the valuable and kind assistance which, in the printing of this volume, as well as on other occasions, I have received from my much-esteemed friend, RICHARD KING, the companion of Captain Back in his expedition in search of Captain Ross; on which occasion, as well as during the epidemic attack of cholera at Bilston and Darlaston, his humanity and zeal, as well as his ability, were actively displayed.

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LECT. XXI.

ON THE MUCOUS MEMBRANES.

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LECT. XXIII.

ON THE MUCOUS MEMBRANES.

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LECTURES
ON
PATHOLOGICAL ANATOMY.

LECTURE XIII.

ON THE
GENERAL ANATOMY OF MUCOUS MEMBRANES.

ANALOGY BETWEEN MUCOUS MEMBRANES AND THE COMMON INTEGUMENTS —
DIFFERENCE BETWEEN THE TEGUMENTARY AND SEROUS MEMBRANES—CON-
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GENTLEMEN,

IN pursuance of the plan with which I commenced—namely, that of making General Anatomy the basis of my division in the present Course—I have now to solicit your attention to another of the structures or tissues of which our bodies are composed—I mean, the Mucous Membranes. These, as I have already shewn you, are closely allied to the Serous, and, in their remote origin, may, as I hinted on a former occasion, be considered as derived from them: they are, however, possessed of so many peculiarities, and in various ways are so important, that both general anatomists and pathologists are amply justified in considering them as a class by themselves.

Analogy between mucous membranes and common integuments.

The common integuments, with which all the mucous membranes, natural to the body, are continuous, together with these mucous membranes, constitute an unbroken covering both to the internal and external surfaces of the body; consequently, it is on them that all external agents must first act. They are the organs of some of the most important functions, such as absorption and excretion: they are constantly liable to be deranged by disease: and it is to them that our therapeutical agents are applied. Hence, a knowledge of these membranes, in health and disease, constitutes one of the most important objects to which the attention of the medical student can be directed. The skin and the mucous membranes possess so many features in common, that their close alliance, in an anatomical point of view, has been admitted ever since the time of Galen; and Meckel, Beclard, and Blainville, have been induced to bring them together, under one head: the first calling them ‘the internal and external cutaneous systems’; the second calling them both, ‘tegumentary membranes’; and the third

speaking of them under the appellation of 'general envelop or covering.'

Both divisions of the tegumentary membranes differ from the serous membranes which we have quitted, not only by the quality of their secretions, whence their respective names are derived, but also by their presenting, instead of a smooth and uniform surface, one which offers irregularities, for the most part extremely minute, and which is furnished with more or less numerous superadded parts or organs. Hence, they have been called the compound villous and follicular membranes.

Difference of the tegumentary from the serous membranes.

Galen, as I before remarked, pointed out some of the characters which, being possessed in common, connect the cutaneous and the mucous membranes. Other anatomists noticed their absolute continuity, and the analogy which exists between mucous secretion and the epidermis. Bonn, in a treatise "*De continuationibus membranarum*," dwelt with considerable minuteness upon the continuity of the two surfaces. Bichat likewise insisted on the same circumstance: and Heberard has particularly written on the reciprocal transformation of the cutaneous and mucous systems into each other; as, for example, when a part usually covered by mucous membrane, from an alteration of its position, becomes an external part, and consequently exposed, without protection, to the external air; in which case it acquires the characters of the skin: an illustration of which is seen in prolapsus uteri, and in some cases of artificial anus. On the other hand, when two surfaces covered by the skin are kept constantly applied to each other, and protected from the free access of the external air, and from contact with foreign bodies, they acquire the characters of the mucous membranes; as is sometimes seen in permanent contraction of joints. Meckel has strongly insisted on the identity of the systems constituting the covering to the internal and external surfaces of the body; but there is no one who has carried this resemblance so

Opinions of authors as to the connection between the skin and mucous membranes
— Bonn—

Bichat—

Heberard—
on the convertibility of the two systems.

Meckel on the identity of the two systems.

Blainville,
on the com-
parative
anatomy of
the tegu-
mentary
membranes.

Zoophytes.

Polypi.

Progress of
develop-
ment.

Increased
complexity
of the tegu-
mentary
membranes.

far, and so completely developed it, as Professor Blainville; who, commencing with the general covering of the body in its simplest form, as exhibited in the lowest specimens of animal life, proceeds to shew the various modifications which it receives as we ascend in the scale of animals, partly from differences in position, and partly from the complications dependent on the superaddition of particular organs devoted to special purposes. Thus, in some of the lowest forms of the zoophytes, we find an external surface everywhere in contact with the fluid in which the individual is placed. There is no internal cavity; and, consequently, this same external surface is subservient to all the purposes of nutrition, respiration, and generation. As we advance a step higher, we find in the polypi not only an external surface, but a cavity of greater or less extent, which appears as if formed by a portion of the external envelop reflected or inverted into the substance of the animal. This cavity, which seems to exhibit nature's rudest attempt at the formation of a stomach, has only one orifice, which is at once mouth and anus: it is devoted to the purposes both of digestion and generation; and I have myself seen the young animals and the rejected portion of food thrown off by a similar effort. As we ascend the scale, we find this cavity lengthened into a canal, and furnished with two openings instead of one; yet the continuity of the general envelop remains unbroken. So many functions are no longer allotted to the same organ; and instead of one portion only of the general envelop being inverted upon itself, and lodged in the substance of the individual, we find several of these inverted portions, some of which communicate with a more important cavity, whilst others remain as blind pouches or *culs-de-sac*. Thus the respiration becomes distinct from digestion, and generation from both.

The membrane which forms the covering of these surfaces, internal and external, becomes progressively more

and more complicated: 1st, in the number of its layers; which, as I shall shew you, when I come to speak of the external or common integument, may amount, according to Blainville, to not less than six: and 2dly, in the parts which are superadded to it. These superadditions, whether belonging to the internal or external surfaces, may be classed under two heads; the former comprising all the modifications termed follicles or crypts; the latter those to which Blainville has applied the name of '*phanere*,' a term of his own invention, which I shall presently explain.

The crypts (derived from the Greek word κρύπτος, *hid* or *concealed*) are described by Blainville as consisting of an external fibrous covering, pierced at both extremities;—at the internal, for the passage of the vessels and nerves, which are necessary for its function; and at the external, (which sometimes assumes the form of a canal,) by the orifice at which the product of its secretion escapes. Within this external membrane, or capsule, is a second membrane, adherent to the internal surface of the former: it appears to be composed, in a great measure, of vessels, the number of which is probably in proportion to the rapidity and abundance of the secretion which the crypt is destined to produce. Apparently, very few nervous fibrillæ enter into the composition of the crypt, which, in this respect, is very different from the '*phanere*.' The interior of the crypt, so formed, is filled by a fluid, not, in every instance, of the same nature, but always secreted by the internal or vascular membrane. After this fluid has been retained for a longer or shorter time, it is rejected by the external orifice, to perform its particular service. By its solvent or viscid properties, it may augment the activity of a sense, as of taste or smell: by means of acid or other qualities, it may exert a chemical action subservient to digestion; or it may become a means of protection and defence, when it is either very greasy, viscid, or mucous, and is spread over the surface of the membrane.

Explanation
of the term
'crypts.'

Explanation
of the term
'*phanere*.'

The '*phanere*' likewise consists of two parts: the first, the essential, living, or internal part which produces; the second, the accidental, or external part which is the product. The one is the bulb; the other is the apparent or visible part, such as the shaft of the hair. It is from the circumstance of the organ presenting this external or visible part that the word '*phanere*' (derived from the word *φανερὸς*, *evident* or *manifest*) has been employed, in opposition to the word '*crypt*.' The bulb of the '*phanere*' is always situated more or less deeply, sometimes even beneath the cutis. It is composed, first, of an external fibrous covering, on which its form depends, and which is pierced at both extremities; by the internal of which openings it receives its vessels and nerves: secondly, of a vascular or more internal coat, formed by the ramifications of the arteries and veins, which have penetrated the outer coat: and, thirdly, of a part which sometimes assumes the form of a coat or membrane, derived from the nerves which had traversed the other coats to penetrate the bulb.

Views of
Professor
Blainville.

It would be foreign to our present purpose to follow the ingenious Professor through all his views, respecting the development of these two classes of appendages to the general covering of the body: suffice it to say, that he refers many of the most important secernant glandular structures, with the teeth, and most of the organs of the senses, to one or other of these types. As I proceed, I shall have repeated occasions to allude to, and explain, some of these curious speculations. I may remark by the way, that the supposed analogy between the teeth and the hair is an idea by no means peculiar to Professor Blainville: it was pointed out by Bonn, and was farther developed by Walter and La Vagna.

Without at all disputing the obvious connection and many points of similarity between the skin and the mucous membranes, I have judged it most expedient to take up the consideration of them separately;—and, as I have already

stated, shall first enter on the subject of the Mucous Membranes.

If we except the sketch of a classification of the different structures or tissues drawn up by Dr. Carmichael Smith, general anatomy can scarcely be said to have had an existence before the time of Bichat. This truly extraordinary individual appears to have been the first who brought together the membranes, lining those cavities which communicate directly or indirectly with the surface of the body, into one system, under the name of the 'mucous system.'

Establishment of the mucous system by Bichat.

Almost all succeeding anatomists and pathologists have followed his example, and adopted his ideas on this subject. The late Dr. Gordon of Edinburgh formed an exception; for he considered the differences, presented by the mucous membranes in different parts of the body, as too considerable to admit of their being comprehended under one common head. Bichat describes the mucous membranes as presenting two considerable surfaces, and one of much smaller extent than the other. The first, to which he gives the name of 'gastro-pulmonary,' constitutes not only, as its name implies, the continuous lining of the alimentary canal, and of the air-tube and air-cells, but also extends from the pharynx to the nose and nasal cavities, from thence through the lachrymal ducts to the eyes, and from the pharynx, through the Eustachian tube, to the tympanum. The next is the genito-urinary, which lines the infundibula and pelves of the kidneys, the ureters, the urinary bladder and urethra, the vasa deferentia in the male and in the female, the vagina, uterus, and Fallopian tubes. In birds, reptiles, and fishes, these two extensive portions of the mucous system are united, by means of the cloaca, which forms the common termination of both. A similar conformation is occasionally met with as a monstrosity in the human subject. In some reptiles, the membrane corresponding to the conjunctiva is detached from the gastro-pulmonary mucous surface; and in fishes, the membrane

Bichat's division of mucous membranes:

Gastro-pulmonary;

Genito-urinary.

lining the cavity devoted to the organ of smell, as well as that covering the eye, is detached from the principal part of the mucous system. The third, smallest, and last portion of the mucous system exhibited in the human species is that which, entering at the orifices of the nipples, lines the lactiferous tubes.

Mucous
membranes
not derived
from the
skin.

Opinion of
Meckel on
the mode of
formation of
mucous
membranes.

Although the mucous membranes may be regarded as modified prolongations of the external covering of the body, turned inwards and penetrating the substance of the animal, we must not allow this consideration to induce us to suppose that the membranes lining the internal surfaces are produced and derived from that which covers the exterior of the body. We might with almost equal reason suppose that the cutaneous system was formed from the mucous, as this latter from the cutaneous. The question is worthy of some attention. "In considering," says Meckel, "the cutaneous system (that is, the skin and the mucous membranes) as a bag folded upon itself, I do not mean to describe the origin of the different parts, or to insinuate, that the various cavities are formed from the surface inwards, through a mass which was at first solid and homogeneous, in such a manner that the upper and lower portion of the alimentary canal met each other half way, whilst the other cavities, not extending so far, preserved their appearance of blind passages or *culs-de-sac*. There are, it is true, some facts which seem to favour such a hypothesis. Thus, for example, the apertures do not exist at first, not appearing until the sixth week of foetal existence; and it is not uncommon for the upper and lower portions of the alimentary canal to be separate from each other, each of them forming a *cul-de-sac*. But these phænomena do not prove that the internal portions of the cutaneous system, that is to say, the mucous membranes, owe their origin to the prolongation of the external portion into the interior. The absence of the openings, at the commencement of the animal's existence, may be explained

without having recourse to this hypothesis, by admitting that the skin is gradually broken through at the points at which these openings exist, in consequence of the progressive formation of the cavities proceeding from within, outwards. This view appears to be more correct than the former; since, in the first place, the point at which the upper and lower portions are separated, when such a want of continuity exists, is by no means uniform, but is found occurring in very remote situations; and it most frequently happens that the want of perforation is connected with one extremity, generally the lower: consequently, in such a case, and on this hypothesis, the development of the internal portion must have proceeded from one extremity only. Secondly, it is not uncommon for both the superior and inferior openings to be wanting, or for several interruptions to be met with in the course of the canal. Thirdly, a similar disposition may be met with in other prolongations of the skin, which also terminate in a *cul-de-sac*: for example, in the urinary and genital apparatus, in which it often happens, that with the exception of the spot at which the obliteration exists, and which is frequently of very limited extent, both the internal and the external portions are perfectly developed; whilst, by the hypothesis in question, the formation ought to have been arrested at the point of obliteration. We shall then be nearer to the truth," continues Meckel, "in admitting that the formation of the internal portion of the skin (or mucous membrane) proceeds from within, outwards;—that there are probably several principal points whence the formation proceeds;—that, as the development advances, these different portions are first united; and that, lastly, they join with the common integuments, and thenceforth become one with them."

The alimentary canal, and the urinary bladder (as I hinted when speaking of the importance of the serous membranes), are by some supposed to be derived from sacs of this kind, which belong to the earliest period of the ovulun,

Derivation
of mucous
membranes
from foetal
sacs.

Umbilical
vesicle.

Communica-
tion between
the umbili-
cal vesicle
and the in-
testines.

and which at that period would appear to be of the highest importance; since in the embryos of many animals they are then of the greatest proportionate size; and in some, amongst which must be reckoned that of man, are only then to be discovered. The umbilical vesicle, to which the formation of the intestinal tube is attributed, is a rounded bag situated at the anterior part of the embryo, between the chorion and the amnion; but not, like these, constituting a covering to the little animal. From its persistence in the embryos of carnivorous animals, it is the most easily observable in them, and has received the name of erythroid membrane, being red, and highly vascular. It is regarded as corresponding to the vitelline sac or yolk-bag in birds; in which it is of the utmost importance, as containing the material by which the growth and support of the young animal is maintained, and supplying the place of that nourishment which the young of the mammiferous animals derive before birth from the placenta, and after birth from the lactiferous glands. The omphalo-mesenteric vessels described by Chaussier pass from this sac to the intestines; and by Emmert, Hochestetter, and Cuvier, are supposed to constitute the only communication between the intestines and the umbilical vesicle: yet the analogy to birds, in which there is a distinct opening forming a communication between the two, would lead us to infer that such was originally the case in man. In fact, the authors whom I have mentioned, admit the existence, in addition to the omphalo-mesenteric vessels, of an impervious cord passing from the vesicle to the intestines; and it would appear highly probable that this cord is the trace of an obliterated canal. The existence of such a communication, originally, seems essential to the theory of the formation of the canal from this vesicle. Its persistence is not required, as the contents of the canal are derived from another source; and its obliteration is very possible, and supported by analogy. According to Meckel and Oken, who have

principally considered this subject, the umbilical vesicle penetrates the abdomen of the embryo, and becomes contracted, and finally obliterated at the umbilicus. Within the abdomen, it is prolonged both upwards and downwards, and thus constitutes the alimentary canal. The fact to which I have before alluded, of this canal terminating in a blind extremity in both of these directions, would seem to afford some confirmation of this theory, in addition to the analogical reasoning upon which it mainly rests.

The anatomists and physiologists who have investigated this subject are by no means agreed as to the point at which the alimentary canal communicates with the umbilical vesicle. This circumstance ought neither to surprise us, nor to be regarded as militating strongly against the validity of the theory, when we consider the very early period at which the supposed communication is, by all, admitted to cease; and that, at this period, the structure of the newly-organized being is both ill adapted to receive permanent impressions, and is also undergoing, in its rapid development, those changes by which the traces in question must be obscured, if not obliterated. According to Oken, the communication between the Vitelline sac, or umbilical vesicle, and the intestine, takes place in man, and other mammalia, at the junction of the large and small intestines; and the traces of it are to be found in the appendix vermiformis. Meckel, on the other hand, considers that the communication takes place somewhat higher up in the course of the ileum, in which situation a diverticulum is occasionally found. Tiedmann, Cuvier, Dutrochet, and Jager, agree with Meckel in this view.

Part of the intestinal canal at which this communication takes place.

Opinions of Oken;

of Meckel.

With respect to the opinion of Oken, I am induced to reject it, not only from the objection advanced against it by Meckel, but also from the circumstance, that the appendix vermiformis, although we know so little of its use, appears to exist as an organ designed for a special purpose, and not as a part whose office has ceased, and whose exist-

Objections to the opinions of Oken.

ence is continued accidentally. Its whole internal surface is covered with follicular glands, which are evidently the organs of pretty active secretion. Moreover, the appendix vermiformis bears a very close resemblance to those numerous appendices which communicate with the duodenum in many fish, appearing to correspond with the pancreas, and which certainly cannot be regarded as the vestiges of canals of communication with any membrane belonging to the state of the ovum. Hence, I conceive that the appendix vermiformis must be regarded as in some way subservient to the process of digestion; which obviously assumes a new character in the large intestines: insomuch, that the cæcum has been regarded as a sort of second stomach.

Argument in support of Meckel's views.

The strongest argument in favour of the opinion of Meckel appears to be, that it is with a part of the ileum that the omphalo-mesenteric vessels communicate. The idea, that the diverticulum, which is occasionally found in the ileum, is to be regarded as the vestige of the communication between the umbilical vesicle and the intestine, appears to be much more questionable; first, because the canal of communication, if it exist, is admitted by all to be obliterated at a very early period; and, secondly, because the very appearance of the diverticulum, which is generally of nearly equal size with the intestine, and presents a blunt, rounded, and smooth extremity, appears of itself unfavourable to the idea. I once met with an imperious cord-like ligament, somewhat resembling the urachus, connecting the ileum with the parietes, at a point on the median line not far removed from the umbilicus: this looks something like a vestige of the communication in question, but I can only notice it as a mere conjecture.

Connection between the urinary bladder and alantoids.

The connection of the urinary bladder with another serous sac, bears a very close resemblance to that which I have just described as existing between the alimentary canal and the umbilical vesicle. The sac which, according to this view, is regarded by some as the origin of the uri-

nary bladder, is called 'the alantois,' and, like the umbilical vesicle, is situated in front of the abdomen of the fœtus, between the amnion and chorion. It is extremely evident, and persistent throughout the whole period of the fœtal life, in all ruminating animals; but, notwithstanding the distinctness of the urachus in the fœtus and umbilical cord, its permeability in most cases throughout the period of fœtal existence, and occasionally in after life, it is very difficult in many animals, amongst which we may number man, to detect any vesicular expansion, or 'alantois,' at the extremity of the urachus farthest from the bladder. Nevertheless, Meckel asserts that he has found such a vesicle, in addition to the umbilical vesicle, in a fœtus of four weeks; and I am pretty confident that I have repeatedly seen the same thing, in very early abortions.

I shall now quit the consideration of the formation of the mucous membranes, to say a few words respecting their structure. In this respect, they present so many varieties, according to the parts in which they are situated, that I shall offer but little on this subject in my general remarks; as I must return to it, when I speak of the mucous membranes individually.

General
structure of
mucous
membranes.

The term 'mucous membrane' appears to have been first applied to that portion of the system which belongs to the nasal cavities. This structure has also received other names; such as, the villous or fungous membrane, the porous, the villosopapillary, and the pituitary.

Like the serous membranes, the mucous membranes have two surfaces; the one attached, by which they are connected to the textures which they invest; the other free, upon which their own proper secretion, and also that of their follicles or superadded glands, is poured out. But instead of forming close sacs, like the serous membranes, they all, in their natural state, present at least one opening, either directly or indirectly communicating with the external air. Instead of a smooth and polished surface, like the

Comparison
of serous
and mucous
membranes.

secreting surface of the serous membranes, the mucous membranes present one which is more or less irregular and villous: nevertheless, they offer the greatest variety in this respect.

Ultimate
structure of
mucous
membranes.

By some who have paid much attention to the microscopic investigation of the ultimate structure of the animal tissues, the mucous membranes are said to be composed of spherical molecules of uniform size, arranged in chaplets, like strings of beads variously disposed. In the researches of this kind which my friend Joseph Lister and myself have made, and often repeated, with the assistance of glasses much more powerful than those possessed by the anatomists to whom I have alluded, we have seen nothing to induce us to confirm the theory of globules, with reference to the mucous, any more than to the serous membranes. At the same time, I must add, that we have not detected in the mucous membranes that distinctly fibrous texture which belongs to some, at least, of the serous membranes: their structure is of a more amorphous character. Our investigations, however, with respect to this and some other structures, are, as yet, by no means complete.

Vascularity
of mucous
membranes.

The mucous membranes are, for the most part, very liberally supplied with blood-vessels, which are subdivided into the most minute ramifications. The capillary system predominates; but the different parts of the mucous membranes are by no means similarly circumstanced in this respect. There are, likewise, most remarkable differences in the quantity of blood which the same membrane may receive at different times.

Varying ex-
tents of mu-
cous mem-
branes.

The mucous membranes adhere with very different degrees of firmness to the structures which they invest; but, in most situations, their surfaces are greatly extended by the folds and processes which they form. Most of them readily admit of the distension and contraction of their cavities; and these folds tend most materially to facilitate the variations in form and capacity to which they are con-

stantly liable. Many of these movements are effected by a layer, in most cases double, of contractile fibres, generally considered as muscular; which may be regarded as an appendage to the mucous membrane, constituting a true panniculus carnosus. The striking difference which may be observed between these fibres and those of true muscle, when both are viewed through a powerful microscope, as well as a dissimilarity in their chemical composition, have convinced me that they should be regarded as distinct animal tissues, and that the term 'muscular coat' should be abandoned*. The movements effected by these fibres are not the only motions which may be observed in connection with mucous membranes.

Contractile
fibrous coat.

During life, or immediately after an animal has been killed, extremely minute ciliary movements have, by the help of powerful glasses, been seen in active operation upon the free surface of several of these membranes; and it is very probable that they also take place on others which have not yet been discovered to possess them. It seems highly probable that the use of these movements is to carry forward the secretion upon the surface of the membrane. Most interesting and important light has been thrown on these circumstances by my friend Professor Sharpey. To the layer of contractile fibres the mucous membrane is connected by cellular tissue, the density or laxity of which is proportioned to the destined functions of the part. This layer of cellular structure has, by some anatomists of great celebrity, amongst whom may be mentioned Haller, been erroneously considered as a nervous coat. It does not however appear that a large supply of nerves is by any means essential to the mucous system; although, for special purposes, we find certain parts of it most abundantly supplied with nerves, and endowed with exquisite and peculiar sensibi-

Ciliary
movements.

Innervation
of mucous
membranes.

* See the Appendix to the Translation of Dr. Edwards's work on the Influence of Physical Agents in Life.

lity; as, for example, in the mouth and nose. Other parts of this system, notwithstanding their high degree of vital activity, are possessed of comparatively feeble powers of sensation: thus, almost without our consciousness, fluids pass the œsophagus, and are lodged in the stomach, which are at so high a temperature, or are possessed of such acrid qualities, that their presence in the mouth, or even upon the common integuments, would be attended with considerable suffering.

Appendages
to the mu-
cous mem-
branes.

The different parts of the mucous system are by no means equally supplied with follicular and other appendages; and we shall have frequent occasion to observe that those parts in which they abound, claim peculiar attention.

Whilst some parts, as, for example, the œsophagus, are protected by an epidermis, the greater portion wants this covering, and is defended only by its mucous secretion; though Haller, and some others, have contended for the contrary*. It is most likely that they have mistaken an accidental layer of lymph or false membrane, the result of inflammation, for an epidermis.

Pathology
of mucous
membranes.

I shall now proceed to call your attention to some general remarks on the pathological state of the mucous membranes. Although, as I trust, I shall be able to shew you that there is a certain degree of resemblance in the diseases and derangements of all the membranes of this class, you will readily conceive, *à priori*, that the varieties which they present, not only in their structure and situation, but also in the functions to which they are respectively subservient, must give rise to very many corresponding differences in their diseases and morbid appearances; and that consequently, whilst my general remarks must be

* The structure of the epidermis and epithelium has lately been made the subject of careful microscopic observation, by Dr. J. Henle, Prosector in the University of Frederick William, Berlin. See the note at the end of the volume.

few, I shall have to dwell for a considerable time on some of the particular membranes.

Like the serous membranes, the mucous membranes present us with instances of deviation from the normal state, the result of deficiency or excess. There are, perhaps, no instances of complete congenital deficiency of an entire mucous membrane; except in those rare cases of monstrosity, in which all the component parts of an important portion of the body are simultaneously deficient. Thus, for example, the mucous membranes of the eyes, nose, mouth, and lungs, are necessarily deficient in those monstrous foetuses in which the whole upper part of the body is wanting. Partial congenital deficiencies in the mucous membranes are of much more frequent occurrence. As instances of these, I may mention the cases to which I have already alluded, in speaking of the formation of the alimentary canal; namely, of deficiency at the upper part, producing a want of communication between the mouth and the stomach; or, at the lower part, producing not only imperforate anus, but, in some instances, the termination of the intestine in a *cul-de-sac*, many inches higher than where the anus should be found. Deficiency of the anterior part of the bladder affords another good instance of the kind of deficiency of which I am speaking.

Deficiency
of mucous
membranes
—congeni-
tal.

There are very few instances of the occurrence of a redundant mucous membrane. They are perhaps only to be met with as forming a part of an organ which, in itself, is altogether redundant: thus, they must doubtless exist where there are two uteri, or where there are three or more ureters. Instances of a partial congenital redundancy are by no means unfrequent: the occurrence of a double velum palati, and of the diverticulum to the ileum, may be adduced as some of the best examples of this kind of excess.

Excess of
mucous
membrane
—congeni-
tal.

Deficiency, or redundancy, may likewise be induced at a subsequent period. The former is generally a sequel to

Deficiency
and excess
acquired.

some other affection, as in strictures of the œsophagus, rectum, or urethra, and in destruction of the velum and neighbouring parts, from syphilis, frambœsia, or sibbens. Considerable portions of the mucous membrane of the stomach are occasionally lost by ulceration. An acquired redundancy of a mucous membrane is a far more frequent occurrence. In many instances, it appears to be occasioned by mechanical causes concurring with the preternatural laxity of the sub-mucous cellular membrane. Thus the Schneiderian membrane is sometimes formed into folds, producing one of the most troublesome forms of polypus nasi. The mucous membrane of the alimentary canal is liable to very considerable increase, from accumulations within the canal. The stomach, for example, is sometimes seen to acquire five or six times its ordinary size, in consequence of stricture of the pylorus; and the colon, and sometimes the small intestines, are correspondingly developed from stricture of the rectum. The mucous membranes are liable to be dilated into pouches. Of these, examples are the most frequently met with in the urinary bladder. They are occasionally seen in the alimentary canal. Such pouches have been designated by the term 'false diverticula,' and are at times occasioned by the lodgment of foreign bodies. Horses are said to be subject to them, when affected with intestinal calculus. A partial and morbid extension of a mucous membrane sometimes takes place in consequence of the development of an accidental deposit in the subjacent structures: this is well seen in some cases of polypus uteri, which owe their origin to the formation of scirrhus tubercles very near to the internal surface of the organ; and which, as they increase in size, distend the mucous lining, and derive from it not only a covering, but also a neck, or peduncle, which admits of their protrusion through the os tinæ. To these cases, of the morbid increase of a naturally existing mucous membrane, must be added those of the accidental production of

this tissue which are occasionally seen in cysts and tumors; as, for example, in the ovaries, in the parietes of the alimentary canal, and beneath the common integuments. We have likewise in the membrane lining old sinuses, the accidental production of a structure bearing, in some of its characters, a considerable resemblance to the mucous membranes; and which, by many, if not most pathologists, is regarded as such, since it more nearly approaches to them than to any other tissue.

I have already mentioned a preternatural fold of the relaxed and elongated mucous membrane, as constituting what is sometimes regarded as a form of polypus. The mucous membranes are also liable to another form of projecting growth, to which the name of polypus has been applied; and which may be noticed here, as it consists of a partial hypertrophy or redundancy. Some of these polypi are considered as malignant; but others do not appear to be accompanied by any constitutional affection calculated to entitle them to this appellation. It is of these last, or non-malignant polypi, that I now speak. They are for the most part soft, abounding in fluid parts, of a pedunculated pyriform figure, vascular, and more or less transparent or translucent, in proportion, as it should seem, to the length of their standing; the oldest, as one would reasonably expect, being the most opaque. They are often more firmly attached to the subjacent structures than is generally the case with the mucous membranes in the healthy state; and are said to be affected by the hygrometric state of the atmosphere, being enlarged, soft, and moist, when the air is damp. The situations that are most favourable to their occurrence appear to be such as are near the junction of the mucous membranes with the common integuments, though not actually upon the line of union. Thus we find them within the nasal cavities, upon the turbinated bones, or within the antrum; also in the rectum, not far from the verge of the anus; and growing from the os tinæ, or its

Partial
acquired ex-
cess of mu-
cous mem-
brane form-
ing polypus.

vicinity. But little appears to have been done towards elucidating the structure and mode of formation of these bodies, which I have had but few and imperfect opportunities of examining for myself. They would seem to depend on an irregular and exuberant nutrition, unaccompanied by those signs of local or general irritation which are wont to characterize inflammatory processes. I suspect that some of them bear a similar relation to malignant polypi, or excrescences of the mucous membranes, that the non-malignant, simple, and compound serous cysts do to the malignant tumors which have formed the subjects of some of my former Lectures. The common integuments furnish analogous instances of partial exuberant growth.

Varieties in the secretions of different mucous membranes.

Before I proceed to speak of the morbid alterations of structure exhibited by the mucous membranes, I must say a few words respecting the varieties which may be observed in the secretions or exhalations which take place upon their unattached surfaces. Even in the healthy state, the secretions of the different mucous membranes present considerable varieties in different parts of the body. Thus, from the conjunctiva, the secretion contains so small a quantity of mucus, that it is to all appearance aqueous. In the mouth it is somewhat more viscid; yet still may be regarded as a watery secretion, in all probability in consequence of the abundant admixture of the fluid poured into the mouth by the salivary glands. On the Schneide-rian membrane it is much more thick and viscid. The same may be said of the membrane lining the air-passages, almost to their very terminations; and, in a still greater degree, of that lining the alimentary canal, and more particularly the stomach, in which cavity it is often very abundant and ropy, without amounting to a morbid appearance.

Some of the purest specimens of mucus may occasionally be obtained from the gall-bladder, when the ductus cysticus has been long and perfectly obstructed. The mucus so collected is as transparent as rock-crystal; and possesses a

considerable degree of fluidity, in conjunction with a remarkable tenacity, which admits of its being drawn out, almost like melted glass. The bladder and urinary passages do not seem in a state of health to furnish more mucus than is necessary to defend the membrane from the acrimony of the urine. Its presence is, consequently, rarely perceptible, excepting in a state of disease.

From the compound nature of the mucous membranes, which are furnished with more or less numerous and complicated secreting appendages, it is by no means easy to determine how much of the quantity and quality of their secretions is to be attributed to the membranes themselves, and how much to the appendages in question. In the mouth, fauces, and intestines, and still more conspicuously at the *ostinæ*, it is evident that mucus is the product of the follicular apparatus; yet the presence of abundance of perfect mucus in those cysts which form the link between the serous and mucous membranes, and also on those mucous membranes which are not abundantly supplied with follicles, leave no room to doubt that the membranes, as well as their follicles, are capable of producing mucus. It would seem, that, in some situations at least, as for example in the stomach, particular properties are possessed by the follicular secretion.

Apparatus
for the se-
cretion of
mucus.

From the differences of which I have been speaking, it is obvious that considerable variety must be met with in the analysis of the secretions of the different mucous membranes; yet it is highly probable, that pure mucus is a pretty uniform animal product, and that the difference observed depend on the admixtures by which it has been contaminated. The composition of mucus is thus given by Berzelius:

Chemical
analysis of
mucus.

Water	933.9
Mucous substance	53.3
Muriate of potass and soda	5.6
Lactate of soda and animal matter	3.
Soda9
Phosphate of soda and animal matter	3.3

The specimen analysed was taken from the nostrils or trachea, in which situations he says that the mucus is perfectly similar.

Variations of
secretion
produced by
disease :
suppression ;

Under the influence of disease, the secretions of the mucous membranes present still further variations. But first I may mention, that on many of the mucous surfaces secretion may be wholly, or in part, suspended. This is occasionally, but rarely, seen in the conjunctiva : it is much more common, as a partial occurrence, on the Schneiderian membrane, where, when inconsiderable, it can hardly be regarded as disease. It is often brought on by the not very delicate practice of taking snuff ; and, when induced, this defective secretion renders it very difficult to abandon the offensive habit. Diminished or almost totally suppressed secretion is not very uncommon in the fauces. A similar state of the membrane lining the bronchial tubes is one of the pulmonary affections noticed by Laennec, who has described it under the name of *catarrhe sec.* It is not very unfrequently met with in the intestines, both large and small. Some of the phænomena dependent on the diminished secretion of the mucous membrane have been treated of by Fischer, in a thesis published at Bonn.

secretion of
air ;

Next to the total suppression of the mucous secretion, may be mentioned the somewhat allied affection of the accumulation of air in the cavities lined by mucous membranes. Though it is probable that, in some instances, the gaseous fluids so accumulated are either introduced from without, or generated by the decomposition of the contents of the cavities ; yet there is reason to believe, that in other instances the gases have been secreted by the mucous membranes, as I have stated to be sometimes the case with the serous membranes. The flatulent distension of the stomach, though in most cases ascribable to the two first-mentioned causes, may, in others, be the effect of a morbid secretion of the stomach itself. In both the large and small intestines, collections of air are not unfrequently met

with; which, not only from their analysis, but also from the particular appearance of the membrane lining the parts in which they are found, I can regard only as a production of the membrane itself. The membrane lining the uterus has been known to produce air in a quantity sufficiently great to produce considerable distension, and, by its occasional escape, to cause a curious and audible effect.

The secretions of the mucous membranes are liable to be very considerably increased. This, as we shall hereafter see, is generally the attendant or sequel of an inflammatory state; but I believe that it is at times produced by a primarily atonic state. Such redundant secretions, by whatever cause produced, have been called mucous or serous fluxes, according as the secretions retain their mucous character, or present a more thin and watery appearance. They have likewise been frequently known by the appellation of 'catarrhs,' more especially when of an inflammatory character.

augmented
secretion.

Sometimes the secretion from these membranes, instead of being viscid and ropy, has a gelatinous or sizy appearance. It is in general nearly or quite insipid; but occasionally acquires a saline taste, at other times a mawkish sweetness; and that of the stomach an intense acidity, which is ascribed to free muriatic acid. The acid is sometimes present in sufficient quantity to produce a violent effervescence, when it is thrown upon limestone: at other times, the quantity of acid present is so inconsiderable as to require the assistance of a delicate test for its discovery; and to this extent it occurs in other mucus beside that of the stomach. Mucus, at times, acquires a bitter taste, from the admixture of bile. This admixture of bile not only affects the taste, but also gives to the mucus, which, when pure, is colourless and transparent, more or less of a yellow tinge.

Alterations
of mucus in
appearance
and taste.

Mucus is sometimes seen of a greenish hue; and occasionally, without any admixture of bile, it is found of a bright yellow. The former, I believe, is generally a sign of the

Alterations
of colour of
the secretion.

Black colour
frequently
seen in
bronchial
mucus.

subsidence of inflammation in the membrane yielding such a secretion, or symptomatic of a chronic and little active inflammation. On examination after death, I have observed that the membrane producing such a secretion was itself of the same colour*. Mucus, but more particularly that from the bronchial membrane, is not unfrequently of a black or greyish colour, from an admixture of carbonaceous matter. This admixture appears to proceed from two very different causes. The first which I shall mention, is that assigned by the late Dr. Pearson, and Henry Cline, jun.; namely, carbonaceous matter taken into the air-passages with the air inspired. In support of this opinion, it is asserted, that some individuals cough up mucus of this colour when they live in the smoky atmosphere of large towns, but that their sputa lose this colour when they breathe the purer air of the country. The second cause—which is, perhaps, not less frequent than the former—depends on the organ itself in which the blackened sputum is formed. The colouring matter in this case, as well as in the former, is carbonaceous; and would seem to depend on the blood, which, from a deficiency in the respiratory function, has not been able to throw off its carbon in the gaseous form. The carbon thus produced may be regarded as closely allied to the pigmentum nigrum in the eye, and to the colouring matter which I have already had occasion to notice as entering into the composition of melanotic tubercles. One of the reasons which tends strongly to support this view of the origin of the black matter by which mucus is at times tinged, is, that the substance of the membrane itself is often discoloured by the presence of the same pigment in the form of extremely minute particles.

Blood in
mucus.

The secretion from the mucous membranes is not unfrequently discoloured by an admixture of blood. When this is in small quantity, the mucous is said to be sanguinolent;

* See the Observations on Colour, in the First Volume.

but when it occurs in a larger quantity, it is spoken of as a hæmorrhage from the membrane affected. The presence of blood on the surface of a mucous membrane may proceed either from a sensible rupture of blood-vessels, or from an exudation from the minute vessels of the part. These sanguineous exudations are either active or passive: the former generally take place from parts naturally well supplied with minute arteries; and are sometimes idiopathic; at other times, symptomatic, and dependent on sympathy with a distant organ which has been primarily affected. Thus we may see the Schneiderian membrane, the lining membrane of the stomach, and even the conjunctiva, periodically pouring out blood, in cases of amenorrhœa. Whether the hæmorrhage have been idiopathic or symptomatic, it is by no means uncommon, after death, to find that the spot from which the blood had in all probability been poured out, presented very little, if any, trace of the morbid action. Thus, in individuals who have died from hæmoptysis or menorrhagia, it is by no means uncommon to find the interior of the stomach and uterus to all appearance healthy, or, at least, decidedly pale.

One of the most remarkable changes which a morbid action produces in the secretion of a mucous membrane, is its acquiring, more or less completely, the characters of true pus. This change takes place independently of any abrasion of the surface of the membrane on which the altered secretion is poured out. This change of the secretion of a mucous membrane from mucus to pus will appear the less surprising, when we consider how closely some of the specimens of these two substances resemble each other; as is evinced by the numerous tests proposed by various chemists and physicians, with the view of facilitating the distinction between them; most of which tests have, in turn, been rejected as more or less fallacious. After all, the best which has been suggested depends rather on the mechanical than on the chemical composition of the substances. It

Purulent secretion from mucous membranes.

Methods of distinguishing between mucus and pus.

depends on the particled character of one of the fluids, whilst that of the other is more homogeneous; the consequence of which is, that light is decomposed as it passes through the one, presenting an appearance of concentric coloured rings round the luminous object viewed through it, whereas it comes undecomposed to the eye after its passage through the other. This examination is best performed by placing a portion of the fluid between two slips of glass. An instrument for this purpose, called the eriometer, has been invented by (the late) Dr. Young, to whom we are indebted for this mode of testing the two substances. It must be confessed, that this is a point of animal chemistry which, notwithstanding the attention it has attracted, demands still further examination. I look forward with much confidence to important light being thrown on this subject by the labours of my friend Dr. Benjamin Babington, and of several excellent chemists connected with this school. In the mean time, the data already before us are by no means unworthy of consideration. The particles diffused through the purulent secretion on the surface of an inflamed mucous membrane, and upon which the production of coloured rings depends, have been considered nothing else than the particles of the blood deprived of their colouring matter. I need not repeat all that I have already stated, when controverting this opinion in treating of the sero-purulent collections in the cavities of the serous membranes. I then mentioned, that a careful microscopical examination had convinced my friend Joseph Lister and myself, that these two kinds of particles were totally distinct from each other; and that the particles observed in pus are extremely irregular in size and figure, and appear to consist of the coagulable part of an inflammatory effusion, rendered opaque by the loss or diminution of its vitality, and broken up into extremely minute fragments; whilst the fluid, through which these particles are diffused, is modified

by the living action of the surface with which it is in contact.

The secretion on the surface of inflamed mucous membranes presents shades of variety, sufficiently evident to the naked eye; but which, so far as I am aware, have not been either chemically or microscopically examined: they are, probably, intermediate gradations between pure mucus and perfect pus. Sometimes, though rarely, the secretion from an inflamed mucous surface contains so large a portion of coagulable matter, and is possessed of so plastic a character, as to assume the form of a continuous concrete substance or layer; of which we have examples in croup, in that form of diarrhœa which has been called ‘diarrhœa polyposa,’ and in membranous menstruation.

Varieties in the products of inflamed mucous membranes.

I shall now proceed to speak of the alterations produced in the mucous membranes by inflammation. To simplify the subject, I shall first speak of those alterations which belong to the membrane itself; and, subsequently, of those in the glandular structures. As in the serous membranes, so in the mucous, it often happens that one of the first effects of an irritating cause, sufficiently powerful to produce inflammation, is the more or less complete suppression of secretion: at other times, however, a contrary effect seems to be produced, for a more than usually copious flow of thin fluid is the consequence. Mucous membranes, when inflammation has been excited, become more or less deeply reddened by the sanguineous injection of an infinite number of minute vessels; and the surface, so reddened, is often sprinkled with minute points, of a still deeper red; in some of which, ecchymosis appears to have taken place. This state is often confined to the mucous membrane itself; not extending to the subjacent tissues, unless the inflammation be very intense, or have existed for a considerable time. The mucous membrane, at the same time that it becomes reddened by minute injection, acquires a thicker, but also a weaker and tenderer structure; insomuch, that it is often

Effects of inflammation on mucous membranes.

Diversity in liability to inflammation.

Secretions of inflamed mucous membranes.

Granular state of a long-inflamed mucous membrane.

readily torn by the finger-nail. There is considerable difference in the proneness to inflammation exhibited by different parts of the mucous system. This diversity may often be ascribed to the functions of the parts, or to the different degree in which they may be supplied with blood-vessels, follicles, &c. ; but in other cases the distribution of the membrane itself appears to possess a remarkable influence. When a mucous membrane is thrown into folds, these rugæ, especially at and near their summits, seem to have a peculiar tendency to become inflamed. The mucus is altered in quantity and quality, assuming some of the varieties which I have been describing ; and generally in the following order. In the first place, after the secretion has been restored, it retains its transparency ; is less viscid and ropy than usual ; but is often more firm, and less miscible with fluids, than in its healthy state. The often-abundant watery secretion which accompanies it appears to be charged with salts, and is frequently irritating and acrimonious. The secretion subsequently becomes viscid, and more opaque ; after which, it either gradually diminishes in quantity, and returns to its natural character, or becomes progressively more puriform, until it ultimately merits the appellation of pus. When the mucous membrane has been for some time in this state, receiving an increased supply of blood, and pouring out a more or less puriform secretion, its surface, although no abrasion or ulceration may have taken place, becomes irregular, from an infinite number of rounded elevations or granulations, which are generally extremely minute, but bear a close resemblance to those which are formed on the surface of a healing ulcer. The most minute may be seen on the conjunctiva, in purulent ophthalmia ; and on the membrane lining the air-passages, in bronchitis : they are commonly much larger in the alimentary canal ; more especially in the colon, in cases of dysentery. It occasionally happens that one or more of these granulations increase to an inordinate size ; in which case they have

sometimes received the name of caruncles. Instances of this may be seen on the inner surfaces of the eyelids, in the intestines, and in the urethra, where they sometimes complicate stricture.

The inflammation of a mucous membrane sometimes proceeds, from the granular and suppurating state, to unequivocal ulceration. This, however, is not the only mode in which ulceration originates on the mucous surface. It sometimes commences in numerous isolated points; and probably bears a close relation to aphtha, a particular form of inflammation peculiar to the mucous membranes, and commencing in the production of vesicles. Such, at least, is the form which it is believed first to assume in the mouth; that being almost the only situation which admits of our watching the affection in every stage of its progress. It may however be questioned, whether the presence of an epidermis be not essential to the vesicular form. Observations are recorded in favour of both sides of the question. There is, again, another mode in which the ulceration of a mucous membrane may take place; namely, as a sequel to the production of accidental deposits upon the attached surface of the membrane: but of these hereafter.

The characters presented by these ulcerations will, of course, be very much modified by the causes which give rise to them; but, independently of these, there are variations which deserve notice. Sometimes the edges are irregular, thickened, and highly vascular; whilst the interior is ragged and irregular, and the subjacent coats appear to participate in the diseased action. Such is, perhaps, the most common form of ulceration of a mucous membrane, but especially of that of a part of the alimentary canal. There is, however, another form of ulceration, which is not very uncommon: it seldom occupies a large continuous surface, and is much more apt to occur in numerous spots. The peculiarity of the form of this ulceration is, that the edges do not appear to be either augmented or reduced in

Ulceration
of mucous
membranes.

thickness, or to be necessarily accompanied by any increase of vascularity or alteration of colour: in fact, the appearance suggests the idea, that a portion of the mucous membrane has been removed by means of a punch. Such ulcerations may be met with both in the alimentary canal and the trachea; and are sometimes seen as the sequel of aphtha. I have likewise found them in the pituitary membrane of a horse affected with glanders; although in this disease the ulcerations generally present strongly-marked thickened edges. The more or less complete, but partial suppression of the mucous secretion leads, at times, to so complete a derangement of the structure of the membrane, that ulceration follows. Instances of this kind are occasionally met with in the nose and fauces, but they are nowhere more remarkable than in the small intestines. I shall reserve my description of these, until I come to speak of this part of the alimentary canal in particular.

Regenera-
tion of mu-
cous mem-
branes.

An interesting point, to which the consideration of the ulceration of the mucous membranes conducts us, is the possibility of their regeneration, after a partial destruction of them has been induced by ulceration or other causes. Whilst some pathologists maintain that these membranes are readily re-produced, others deny the possibility of such an occurrence. The facts brought forward by the advocates of each side of the question are, I conceive, to be reconciled in the following manner. The mucous membranes, like the common integuments, admit of a considerable degree of derangement, amounting to ulceration, without the entire destruction of the substance of the membrane. In such a case, on the subsidence of the inflammation, the part is restored, with the loss of little or nothing of its original appearance. Very similar cases are continually coming under our notice, upon the common integuments; where very disagreeable and extensive ulcers not unfrequently occur, and subsequently heal, leaving no perceptible trace of their existence. If, however, the ulcera-

tion has been sufficiently deep to occasion total destruction of the mucous structure at a particular part, the cure is effected by the formation of a cicatrix ; which, although it may possess some of the characters of a mucous membrane, and yield the secretion on which its name depends, is, nevertheless, as dissimilar to the original mucous membrane as the most irregular external cicatrix is to perfect skin. The new structure, by which the lost substance of the original mucous membrane is replaced, is produced by granulations proceeding from the edges of the healing ulcer ; affording another point of resemblance between the ulcerations of the internal and external tegumentary membranes. The new substance, in both instances, strikingly exhibits that tendency to contraction, which I stated as characteristic of new structures in general, when I spoke of the false membranes formed upon the surface of the serous membranes ; and which, you will doubtless remember, is sufficiently strong to produce a great deformity of even the bony parietes of the chest. In connection with the mucous membranes, the effect of this contraction is seen in the production of strictures of the urethra and rectum : it may likewise be seen in the fauces, when they have been the seat of deep and extensive ulceration. In many parts of the mucous membranes the same effect may be produced, without causing either much disturbance of function or any very considerable alteration in the appearance. This is owing to the readiness with which the loose and extensible adjoining membrane has yielded to the traction exercised upon it.

Process by which ulcers of mucous membranes heal.

Although the common effects of inflammation attacking a mucous surface are such as I have described, and justify the observation which has often been made, that the mucous membranes are more particularly prone to the suppurative or non-plastic form of inflammation, whilst the serous are as strikingly disposed to the adhesive or plastic form, it is certain that the mucous membranes are by no means exempt

On the proneness of mucous membranes to non-plastic inflammation.

from this latter form. Their comparative immunity from it must be regarded as an admirable provision of nature, when we consider the uses and functions for which the cavities and canals lined by these membranes are destined. It would appear to depend on the circumstance of the mucus or natural secretion of these membranes affording a barrier to the running together of the coagulable part of the effusion, which is nevertheless poured out during the inflammation of this as well as other tissues: hence, it necessarily assumes the form of minute particles. If, however, the quantity of the coagulable effusion be very considerable, and at the same time highly plastic, it may bear too large a proportion to the mucus to be separated by it before coagulation has taken place; or, as I have already stated, the secretion of mucus may be very much suspended, and its serous substitute be incompetent to prevent the coagulable part from assuming the form of a continuous concrete substance. Though instances of false membranes, formed on the surface of mucous membranes, do, I believe, take place in both of these modes, I conceive it is only under the latter circumstances that the coagulable matter can become organized, and constitute adhesions between different points of the mucous surface. In the former case, though a membraniform layer may be formed, I can scarcely conceive the possibility of its contracting an adhesion to a surface from which the secretion of mucus continues to take place.

Chronic inflammation of mucous membranes.

There is, perhaps, no structure in the body which is so liable to be affected with chronic inflammation as the mucous. These inflammations are characterized by the increased quantity and altered characters of the secretion from the affected surfaces. The mucus, in these cases, is generally thicker, and more viscid than usual; or, at other times, habitually assumes a puriform appearance. Such discharges are often called gleet, or blennorrhœal. The membranes themselves are more or less uneven or gra-

nular. They are generally thickened ; and, instead of the soft and pulpy state observable under recent acute inflammation, their structure is often more dense, though it may possess less tenacity than in health. The membrane so affected is not easily detached in large portions from the subjacent parts, and in the most marked examples may almost be described as friable. Pretty large strips of the thickened membrane may, however, be detached, if the thickening be of long standing, and the subjacent cellular membrane be lax and soft. In these differences of consistence and cohesion, we find in the mucous membranes the application of the same principle which I endeavoured to explain when I observed that both softening and induration occur as the results of inflammation amongst the derangements of the serous membranes. In the chronic, as in the acute form of inflammation, there is often a marked increase in the visible vascularity of the parts. At other times, this vascularity is very inconsiderable, or the part may even be remarkably pale. A brown, grey, slate-coloured, and black hue have been insisted upon, as indicating a state of chronic inflammation in some of the mucous membranes. I will not dispute but that these various colours may at times be seen in chronic inflammations of these structures ; but I think they, or at least such of them as depend upon the presence of a greater or less quantity of carbonaceous matter, are not to be regarded as necessarily indicating that a state of chronic inflammation was actually existing, at the discoloured spot, at the time of death. They appear, indeed, to indicate that an increased quantity of red blood had been collected at the part ; but the colour is so far from being a token of the persistence of the irritation which caused the afflux of blood, that it seems rather to indicate its absence.

When inflammation has been excited upon the surface of a mucous membrane, it has much less tendency to spread and to become general than we have seen to be the case

Inflam-
matory soften-
ing, indura-
tion, injec-
tion, disco-
louration.

Spread of
inflamma-
tion over a
mucous
membrane.

with the serous membranes. Yet it is often by no means confined either to one spot, or to the points first attacked. Thus, in the mucous membrane of the alimentary canal we have often occasion to observe that successive or alternate portions have been affected; and, again, in the membrane lining the respiratory organs we often see the effects of inflammation, exhibited first in the nose, and parts connected with it, in the form of gravedo, and, as it subsides in these situations, gradually making its way down the throat, in the form of bronchitis or pulmonary catarrh.

Specific inflammation of mucous membranes.

The mucous membranes are the seat of certain affections which are generally considered to depend on specific diseases or particular poisons: thus, the infection of gonorrhœa is seen particularly to act on the mucous membrane of the urethra, and on the conjunctiva of the eye: syphilis and sибbens attack the nose and throat: scarlatina likewise affects the throat, as well as the integuments: measles, nearly the whole lining of the respiratory apparatus, but more particularly the upper part: hydrophobia, the larynx and pharynx, and frequently the stomach. Arsenic, in whatever way exhibited, is said to affect the stomach and rectum; and cantharidin, the mucous membrane of the bladder.

Gangrene of mucous membranes.

Gangrene of a mucous membrane is sometimes the result of a high degree of inflammation, as we find to be the case in some forms of cynanche, and occasionally in the intestines: at other times it seems to be the result of a more mechanical cause, by which the supply of blood necessary for the nutrition of the membrane is cut off. This is illustrated in some forms of colitis, in which the muscular coat is thrown into powerful contractions. Sometimes the death of a portion of mucous membrane is caused by corrosive poisons. The death of the mucous membrane, in common with that of the accompanying structures, may take place from strangulation, as in intus-susception, strangulated hernia, and the removal of a prolapsed uterus, or of a polypus by ligature.

Complete softening is a condition almost exclusively met with in the gastro-intestinal mucous membrane, and in by far the greater number of cases in the stomach. Whilst by some pathologists this state is taught to be one of the morbid appearances brought on by inflammation, others seem to consider it as *sui generis* ; and others again, amongst whom I may mention Dalmas, jun., think it is occasioned by the inflamed state of the submucous cellular tissue, which prevents the transmission of blood to the mucous membrane. If this be really the mode in which the cases of softening, of which I am speaking, be produced, they must, of course, be considered very closely allied to the cases of gangrene of the mucous membrane already noticed.

Softening
of mucous
membranes.

It is very uncommon for the mucous membranes, either through the influence of inflammation or of other causes, to degenerate, or become transformed into any of the other tissues. Nevertheless, they have been said to become bony. Thus, in the Museum at Pavia, there is a preparation which is shewn as an instance of the ossification of the lining membrane of the uterus : and Dr. Baillie mentions the ossification of the gall-bladder ; which, however, may have been dependent on the subserous tissue, rather than on the mucous membrane. Their conversion into a cartilaginous structure is of more frequent occurrence. Baillie mentions the œsophagus as having been found cartilaginous. Beclard notices the mucous membrane in the lungs as having assumed this state. If he merely alludes to the membrane lining tuberculous cavities communicating with the bronchial tubes, the cases are not very uncommon ; but they can scarcely be regarded as examples of the cartilaginous degeneration of a true mucous membrane : and I am rather inclined to believe that this must have been his meaning ; since he, immediately after, gives us another example of a similar degeneration—the conversion of the secreting surfaces of fistulæ into cartilage.

Ossific and
cartilaginous
degenera-
tion of mu-
cous mem-
branes.

The mucous membranes, like almost every other tissue,

Malignant
diseases of
mucous
membranes.

are liable to become the seat of those diseases which have been called malignant : it is however much more frequently in the sub-mucous cellular membrane, than in the mucous membranes themselves, that these formations take place. In both situations, they may be referred to the type which I have endeavoured to explain in several of the preceding Lectures. At the same time, they afford, especially those which belong to the mucous membranes themselves, a good illustration of one of the remarks which I made; viz. that the form and appearance of these growths are liable to considerable modification, from the structures in which they happen to be situated. In order to render intelligible to you the particular form, or rather one of the forms, assumed by these growths when originating in the mucous membranes themselves, allow me to recall to your remembrance that particular form of compound adventitious serous cyst, in which a great number of pedunculated bodies are seen growing, from nearly the same spot, on the internal surface of the containing cyst. In this case, you will recollect that the dimension in length greatly surpasses that in breadth; that the cavities of these pedunculated bodies are often wholly obliterated, so that they lose the character of cyst; that, at other times, their dilated free extremities retain more or less of this form; and that, in some cases, each of these pedunculated bodies proceeds directly from the enclosing cyst, whilst in others there is one common peduncle to several. I stated, moreover, that these bunches of numerous slender pedunculated bodies, referrible to the type of compound serous cyst, and traced, by almost imperceptible gradations, from the most complete and well-marked specimens, are most frequently met with in the secondary order of cysts; but that they are likewise met with scattered over the internal surface of the principal cyst, without any other cyst or membrane being reflected over them. It is to this last form that I more particularly call your attention; not only as affording the

best illustration of the formation of some of the fungoid growths which proceed from the surface of the mucous membranes, but also as furnishing another point of affinity between the serous and the mucous membranes. The best specimens of the fungoid formations in question are those which occur in the urinary bladder. The nature of the office which this organ has to perform preserves its cavity constantly more or less distended, and its internal surface exempt from much mutual contact of its parts: hence it allows the uninterrupted development of the new growth, and adds another feature of resemblance to the cysts alluded to. Almost equally well marked clusters of these pedunculated bodies may sometimes be found growing from the lining membrane of the trachea. In other cases of malignant affection of the mucous membranes, the new growths have much less prominence, and more nearly resemble what is called warty fungus of the skin.

In proceeding to speak of the morbid appearances of the follicular apparatus, and of the tissues subjacent to the mucous membrane, I must not pass over some appearances of the membrane itself; which, though not necessarily connected with an alteration in structure, are extremely liable to be confounded with the state of inflammation;—I allude to congestion, and the cadaveric deposition of blood. There is no tissue in which these states so frequently occur, or give rise to appearances which it is so easy to mistake, as in the mucous membranes; yet, in the common integuments on the exterior of the body, we may see enough of both these states to enable us to form some idea of the very great diversity of appearance to which they may give rise, without our being under the necessity of calling in the assistance of any more considerable alteration of the structure. In congestion, as in inflammation, we find the vessels of the membrane minutely injected; but in congestion this state is generally more equally diffused than in inflammation; the veins leading from the part are more conspicuously turgid; the mem-

Congestion,
and cada-
veric infil-
tration.

brane is neither indurated nor softened ; the secretion upon its surface is little, if at all, altered in consistence ; and its colour also remains unchanged, except when the transudation of blood renders it sanguinolent, which is frequently the case. We may be farther assisted in deciding whether the appearances are the result of congestion, by finding obvious causes for the existence of such a state : such, for example, as diseases of the heart, lungs, and liver. The cadaveric depositions of blood may be distinguished from the appearances produced by inflammation, by nearly the same characters as those which I have given for the congestive accumulations ; and it is often difficult, but unimportant, to distinguish between the two. In fact, many of these depositions must be regarded as congestions taking place during the last moments of life ; when the enfeebled powers which put the blood in motion still suffice to carry it forward, towards the extreme vessels, but are incompetent to effect its return. The situations in which the injected parts are found, together with the mode of death, when this is known, will afford us the best data from which to draw our conclusions. The great difference between the apparent vascularity of a part, before and after death, is so considerable, that Bichat recommended the occasional dissection of living animals, in order to ascertain the real characters of the mucous membranes in this respect.

Morbid
states of the
follicular
apparatus of
mucous
membranes.

The glandular or follicular apparatus superadded to the mucous membranes are the frequent seat of morbid appearances. Sometimes they are simply enlarged : at other times, a trifling retention of their secretions produces a sort of *acne* of the mucous membrane ; but when the quantity retained is more considerable, it leads to the formation of a tumor, as is sometimes seen in the labial glands. Irritation in the follicles is often communicated to the mucous membrane immediately surrounding them, and produces small areolæ of increased vascularity. At other times, a deposit to a considerable extent takes place

in and around the follicles, before the mucous membrane itself exhibits any appearance of disease, being merely elevated by the morbid structure beneath it; but it eventually gives way, and ulcerates. Where these glands are collected together so as to form continuous patches, as in the aggregate glands of the intestines, the suppression of their secretion, like that of the membrane itself, will at times lead to ulceration. It is in these structures that malignant diseases not unfrequently take their origin. We see this exemplified in the lips, the anus, and the os uteri.

The sub-mucous cellular tissue is the seat of various derangements; which, though of considerable interest to the morbid anatomist, do not appear to have attracted special attention, until very recently. Dalmas, jun., whose name I have already had occasion to introduce to your notice, when speaking of the sub-serous cellular membrane, has likewise treated of the sub-mucous. This structure occasionally becomes distended by air, which appears to be preternaturally secreted in its cells; since, in many of the examples in which it has been met with, its presence could not be attributed either to putrefaction, or to an introduction from without. This kind of emphysema is met with under the mucous membrane of the stomach and of the intestines; and I find one example of its having been met with under that of the biliary ducts*. The serous infiltration, or œdema, of this structure is an affection of much more frequent and general occurrence. In some instances, it appears to be unquestionably acute and inflammatory; of which, remarkable and fatal examples not unfrequently occur in the epiglottis and chordæ vocales. In other cases, the

Lesions of
sub-mucous
cellular
tissue.

Secretion of
air.

œdema.

* It is important not to confound these cases with those of much more frequent occurrence, in which the interstitial production of air is the result of cadaveric change. Particular states of the body at the time of death, and more particularly that depending on Dr. Bright's disease of the kidneys, strongly favour this production of gas, which sometimes commences in a very marked manner, almost immediately after death.

Inflamma-
tion.

infiltration is of a more passive character ; and may, in general, be referred to some cause impeding the return of blood to the heart. Of this kind is the œdema of the sub-mucous cellular tissue of the intestines, occasioned by disease of the heart, or accompanying some cases of chronic peritonitis ; in which last, the difficulty in the return of the blood may be occasioned both by the disease of the liver, which generally complicates this affection, and also by the state of the peritoneum, which is frequently subjected to partial contractions, induced by the deposition of plastic lymph either upon its free or attached surface. Inflammation of the sub-mucous cellular membrane frequently accompanies that of the membrane itself : and Andral, in his Paper on Chronic Gastritis, maintains that the disease in this structure often persists after that of the mucous membrane itself has subsided. One of the most frequent effects of the inflammation of this structure is its præternatural softness and lacerability, whereby it readily admits of the separation of the mucus from the subjacent coats. Sometimes we find in this structure a diffused infiltration of pus. This I have noticed occurring both in the air-passages and the alimentary canal. In one instance, I noticed small circumscribed collections of the same material, beneath the mucous membrane of the small intestines. In other cases, the inflammatory effusion into the sub-mucous cellular membrane, instead of being of a puriform, is of a plastic character ; and in this form becomes one of the causes which lead to the contraction of canals and cavities lined by mucous membranes. The most remarkable examples of this fact are seen in the stomach, in cases of the hour-glass contraction of that organ. They are also met with in the œsophagus, the intestines, and the urethra.

Analogue
and Hetero-
logue depo-
sits.

The submucous cellular membrane is likewise the seat of adventitious deposits, both analogue and heterologue. Of the former kind are masses of fat, mucous membranous cysts containing hair, teeth, and fat, and those tumors

formed by a congeries of minute vessels, and constituting what has been called 'erectile tissue': these, however, may be found upon the free, as well as upon the attached surface; and some forms of hæmorrhoidal tumors, or piles, are said to be of this description. All the malignant structures are liable to be developed in the cellular structure beneath the mucous membranes, and present the characters which I have described in my former Lectures. They often make considerable progress before the mucous membrane, which covers them, is at all effected; but as the process of softening advances, this ultimately gives way, and ulcerates. Even then, this form of the disease presents a character different from that which is exhibited when the affection commences in the membrane itself.

The so-called muscular structure, beneath the mucous membrane, is also liable to morbid derangement. This structure being superadded to the mucous membranes, for the purpose of modifying the form and capacity of their cavities, is chiefly influenced by those causes which interfere with their function in this respect. Thus we find the contractile fibrous coat of the stomach thickened in conjunction with stricture of the pylorus, and that of the bladder in stricture of the urethra. Such augmentation of volume in the contractile fibres may, with propriety, be called hypertrophy; and ought not to be confounded with another form of derangement of this coat, in which its thickness is likewise augmented, but which seems to depend on a morbid infiltration often connected with malignant disease. It appears that this necessary distinction has not always been duly attended to.

Lesions of
contractile
coat of mu-
cous mem-
branes.

Many of the parasitical animals which I have mentioned in my Seventh Lecture take up their residence in the body, in some part of the mucous system; either attaching themselves to the surface, or simply remaining involved in the secretion of the part, which appears to be increased, or otherwise altered, by their presence.

The mucous membranes are variously liable to accidental lesion, which may be produced either by mechanical or by chemical causes. The irritation which they induce is not so prone to spread over the entire surface as in the case of wounded serous membranes; but they offer various points of interest and importance, in consequence of the disturbance of function which they induce, and sometimes from phenomena occasioned by the compound character of the structure of the part.

Sympathies
of mucous
membranes.

Before I conclude this Lecture, it may be well to say a few words respecting the sympathies of the mucous system. The membranes of this class appear to be much less connected with each other sympathetically than the serous membranes: nevertheless, instances are by no means unfrequent of two or more mucous membranes, connected by disease, being sometimes simultaneously, and at others alternately affected. We see relations of this kind between the pulmonary and the gastro-intestinal membranes, and also between this latter and the urino-genital mucous membrane in both sexes. Although the connection of one mucous membrane with another, through the medium of the sympathies, is not very striking and intimate, the sympathies of individual membranes of this class with other parts of the body are not only curious and interesting, but demand special attention, in consequence of the singular and paramount importance attributed to them by some modern pathologists; to the consideration of whose views I must revert, when I speak of the membranes individually; which I shall commence doing in my next Lecture.

LECTURE XIV.

ON THE MUCOUS MEMBRANES.

LARYNX, TRACHEA, AND BRONCHI.

GASTRO-PULMONARY MUCOUS MEMBRANE—THE RESPIRATORY PORTION OF THE MEMBRANE—THE TRACHEA—LARYNX—CONGENITAL AND ACQUIRED DEFICIENCIES—EFFECTS OF INFLAMMATION—PLASTIC FORM—ILLUSTRATIVE CASES—CROUP—PRONENESS OF LARYNGITIS TO RECUR—INFLAMMATION WITH NON-PLASTIC EFFUSION—CAUSES OF PERVERSION AND LOSS OF VOICE—ULCERATION OF LARYNGEAL MUCOUS MEMBRANE—ULCERATION OF MUCOUS FOLLICLES OF THE LARYNX—WARTS IN THE LARYNX—DISEASES OF SUBMUCOUS CELLULAR TISSUE—ŒDEMA LARYNGIS—SUPPURATION—SCROFULOUS TUBERCLES—DISEASES OF THE CARTILAGES—WOUNDS—TRACHEA AND BRONCHI—CILIARY MOVEMENTS ON THIS PORTION—CONGENITAL AND ACQUIRED ANOMALIES IN SIZE AND FORM—CONTRACTION AND DILATATION OF TRACHEA—BRONCHI CONTRACTED, COMPRESSED BY TUMORS &c.—T. W. KING'S OBSERVATION—FISTULOUS OPENINGS INTO THE TRACHEA—DILATATION OF THE BRONCHIAL TUBES—FIRST FORM OF THE AFFECTION—STATE OF THE MUCOUS MEMBRANE—CONDITION OF THE SUBMUCOUS TEXTURE AND NEIGHBOURING PORTION OF LUNG—OBSERVATION OF PROFESSOR LOUIS—CONDITION OF THE SECRETION IN CONJUNCTION WITH DILATATION OF THE BRONCHI—SECOND FORM OF THE AFFECTION—THIRD FORM OF THE AFFECTION—CAUSES—MISTAKES TO BE AVOIDED—OF THE SECRETION OF THE BRONCHIAL MEMBRANE—DEFICIENT SECRETION—INCREASED SECRETION—HÆMORRHAGE FROM THE BRONCHIAL MEMBRANE—SECRETION SOMETIMES REMARKABLY FETID—PROBABLE SECRETION OF AIR BY THIS MEMBRANE—INFLAMMATION OF THE LARYNX AND BRONCHI—DIFFERENCES AS RESPECTS SANGUINEOUS INJECTION—LIVIDITY ACCOMPANYING BRONCHITIS—PRACTICAL OBSERVATIONS—APPEARANCE OF THE INFLAMED MEMBRANE—ULCERATION OF TRACHEAL AND BRONCHIAL MUCOUS MEMBRANE—AFFECTIONS OF THE FOLLICULAR STRUCTURE—POLYPOUS, MALIGNANT, AND OTHER DISEASES OF THE BRONCHI—CASE—INJURIES &c. OF THE TRACHEA AND BRONCHI—INTRODUCTION OF FOREIGN BODIES.

GENTLEMEN,

IN my last Lecture, I completed the remarks which I have thought it necessary to offer on the general anatomy of the mucous membranes, and given a summary outline of the effects of disease on this class of structures. I now proceed to speak of the morbid appearances presented by particular divisions of this system; and shall solicit your attention to

Gastro-pulmonary mucous membrane.

the thoracic portion of the gastro-intestinal mucous membrane. Although prolongations of this membrane are extended into the nasal cavities, into the eye and lachrymal ducts, and also into the Eustachian tubes, I shall for the present pass over these portions; since their derangements are, for the most part, of minor consequence, and may be left for consideration until the organs of the senses, to which they belong, come to be specially treated of.

The respiratory portion of the membrane.

I shall begin, therefore, with that portion of the membrane which belongs to the function of respiration: and, for the sake of convenience, I shall sub-divide this into three parts, since there is something more or less peculiar in the derangements of each. The first of these sub-divisions will comprise the larynx, and perhaps the first part of the trachea: the second, the trachea, the bronchial tubes, and their ramifications: and the third will include the termination of these tubes, in what has been called the parenchymatous structure of the lungs; which, in the healthy state at least, is obviously composed of minute cells, having their internal surfaces necessarily continuous with the mucous membrane lining the bronchial tubes.

Larynx—
Congenital and acquired deficiencies.

The total deficiency of the mucous membrane lining the larynx must be a very unfrequent occurrence; and can seldom be met with, except in some rare cases of monstrosity. Cases of partial deficiency, and of irregularity of formation, are far more likely to be met with; but even these are very uncommon. A slight imperfection in the development is said sometimes to concur with the defect of hearing in the deaf and dumb. Sometimes the superior development of this part, which is wont to take place in males, is suspended, in conjunction with the imperfect development of the testicles. Sometimes the epiglottis is absent, and sometimes it is bifid: it has also been found oblique or curved. The cricoid and arytenoid cartilages have been deficient. The larynx has likewise been found divided by an incomplete vertical septum. The mucous

membrane was necessarily deficient, redundant, or unusually disposed, in correspondence with those irregular conformations of the parts on which it is superposed. Acquired deviations from the usual form or extent of the mucous membrane of this part of the air-passages are much less rare than the preceding: they may be the result of either ulceration or accident.

Inflammation is by far the most frequent cause of morbid appearances in this portion: it occurs in nearly or quite all the forms which I have noticed in my general remarks on the inflammation of this tissue. That form which is marked by the almost total suppression of the secretion is sometimes met with in the living subject, and appears to be characterized by a sibilant respiration; but it rarely falls under our notice, in post-mortem examinations. The plastic form of the inflammatory effusion is sometimes met with in this part of the air-tube, producing a thin false membrane, which, although but slightly adherent, is at times widely diffused; not only lining the larynx, but extending upwards to the fauces, so as to be visible from the mouth, and downwards to a considerable distance along the air-tube. Sometimes the layer of plastic lymph has little or no attachment to the mucous membrane; from which it may be readily removed, leaving the membrane little altered in its appearance. In other cases, it seems to be slightly attached; and when removed, it leaves a bleeding surface beneath. These differences, as I have already hinted, are probably occasioned by the different degrees in which the secretion of mucus has been suspended under the influence of inflammation. This affection, which is generally known by the name of croup, is, in most cases, if not invariably, the result of an extremely acute form of inflammation, which often proves fatal in the course of a very few hours. It is met with both in young children and adults, but by far most frequently in the former. A striking example of croup in the adult occurred in the Maternité, whilst I was a pupil in

Effects of inflammation.

Plastic form.

Illustrative
cases.

Paris. A young woman, in that institution, shortly after her delivery, washed her neck with cold water; and was almost immediately seized with a violent sore-throat, which resisted the active means employed to subdue it. On examining the fauces, they were seen covered with a layer of a concrete whitish substance. The dyspnœa and constitutional irritation were very acute; and the patient was carried off by the attack within a few hours after its commencement. A similar case occurred in the Salpêtrière, a short time after that which I have just mentioned. I extracted the following account of it from the notes of my friend Dr. Foville. Mary Frances Charlotte Masson, aged 72, of a vigorous constitution, had for some days been affected with sore-throat, for which leeches were applied to her neck. On the day following this application, Dr. Foville was called to this patient, and found her in the following state:—Her face was flushed, her eyes sparkling, her neck tender. Her breathing was accompanied by considerable agitation; and the act of respiration was attended by a croaking sound, which seemed cut short. She had a short but painful cough; and experienced the greatest difficulty in attempting to articulate a few words, which could not be heard, on account of the noise of the respiration. The deglutition of liquids could not be effected; and that of solids was not attempted. The pulse was full, and the skin hot and dry. The bowels had been confined several days. Dr. Foville, considering the patient to be labouring under croup, ordered twenty leeches to the neck, and a purgative enema. In the course of a few hours the patient appeared a little relieved; and on examining the throat, Dr. Foville observed a large white surface, which appeared to depend on a false membrane. On detaching and raising a part with a spoon, the subjacent membrane was seen to bleed. The following morning she was in *articulo mortis*. The respiration was shorter and more noisy than on the preceding evening. Sinapisms were applied to the legs

without procuring any relief, and the patient shortly expired.

INSPECTION—A false membrane, rough, and of considerable thickness, was found on both sides of the velum. It was closely applied to the parts which it covered, and had completely received the impression of their form. It extended into the nasal cavities, and was insensibly lost on the back part of the pituitary membrane; but anteriorly, it was abruptly terminated on the palate. It lined the pharynx, and extended only as far as the commencement of the œsophagus; but it penetrated into the larynx, trachea, and its branches, which it lined so exactly, that, after its removal, it might be blown up so as to exhibit the form of the air-passages. It was more firmly attached to the larynx than to the trachea. The lungs were gorged, and the brain strongly injected. The viscera of the abdomen were healthy.

This form of laryngitis, when it occurs in children, is marked by an equally severe and rapid progress. It appears to be, in most instances, the result of exposure to cold; and a damp, as well as keen, dry air appears to be particularly prone to give rise to it: hence there are districts in which, at certain seasons, croup is endemic.

Endemic
croup.

A previous attack of this form of laryngitis appears to have a material tendency to induce an aptitude for the recurrence of the malady; which it probably does by impairing the power possessed by the membrane of producing mucus. The controul which mercury seems, in many instances, to possess over this alarming malady, is, I suspect, in part to be attributed to its tendency to induce a sort of general colliquative state, diametrically opposed to the effusion of plastic lymph, and commonly accompanied by an unusual activity of the absorbent vessels. It is probably by the production of this latter effect that antimonials, given so as to excite nausea and vomiting, are often so eminently serviceable in the treatment of this disease.

Proneness of
laryngitis to
recur.

Inflam-
 mation with
 non-plastic
 effusion.

Inflammation of the mucous membrane of the larynx, without the production of a plastic effusion, and approaching to the suppurative form, is of much more frequent occurrence than the affection which I have just mentioned. It occurs in every degree, from the slightest form, which is merely productive of trifling uneasiness and transient hoarseness, to the most severe; accompanied by extensive ulceration or copious purulent secretion; and occasioning the most painful articulation, or the most complete aphony. It has hitherto been by no means easy to ascertain the precise state of this part during life; but, from the perversion of the voice, it is supposed that, even in the slightest cases, there is more or less thickening and turgescence of the mucous membrane. It is not improbable, however, that the perversion of the voice is in a great measure owing to the irregular or imperfect action of the muscles belonging to the parts covered by the membrane, even when this is slightly inflamed. This idea derives some support from the great perversion of the voice which sometimes accompanies the ulceration of this part when the thickening is found to be inconsiderable; and still more so from the sudden production of great hoarseness, or even complete aphony, from the inhalation of a very small quantity of some irritating gas. Again, in highly nervous females we find hoarseness or loss of voice come on almost in a moment, and as quickly subside; which seems further to indicate that no great change of texture is necessary for this effect. We may reasonably expect to derive much valuable information respecting the condition of this part during life through the assistance afforded by the *speculum laryngis*, or laryngiscope, recently invented by my friend Dr. B. Babington. (1829.)

Causes of
 perversion
 and loss of
 voice.

Ulceration of
 laryngeal
 mucous
 membrane.

The ulcerations of this part are extremely obstinate, and difficult of treatment; partly, as it would appear, from our generally being unable properly to apply any local treatment; but probably much more from the impossibility of

preserving continued and perfect rest of the parts, which places these ulcers in nearly the same predicament with fissures at the side of the mouth or anus. From the extreme irritability as well as the important functions of the parts on which they are situated, they induce the most serious constitutional derangement; and generally lead to tubercular disease of the lungs, if the patient be not carried off by the original affection, in the form of laryngeal phthisis. It is in vain that the patient most rigidly abstains from the use of speech. A friend of my own, for considerably more than a year, patiently and perseveringly performed all the part which he took in conversation by writing alone; but, notwithstanding the favourable chance which he thus afforded to the various means which were tried, and the apparent integrity of the lungs at the commencement of the attack, no satisfactory improvement was ever obtained, and the young man was carried off by pulmonary consumption. I do not know that any examination was made; and am therefore unable to state what was the part of the larynx which in this case was principally affected. In a case which I had the opportunity of examining in Guy's Hospital, the extent of mischief was small, but the ulceration had taken place at the angle formed by the meeting of the chordæ vocales; in which situation the resemblance to fissures at the sides of the mouth is, perhaps, the most striking. The epiglottis appears to be the least dangerous seat of these laryngeal ulcers, since the greater part of this cartilage has been removed by ulceration without a fatal result. It is likewise the part to which our remedies may be the most readily and efficiently applied. The nitrate of silver has, of late, been greatly lauded, as very successful in the cure of these cases.

The mucous membrane lining this part of the air-tube is plentifully supplied with mucous follicles; and many cases of ulceration of the larynx appear to commence in these structures. It would also appear that the abundance

Ulceration of
mucous fol-
licles of the
larynx.

of these glands which occurs about the sacculi laryngis, not less than the form of these cavities, favours the formation of pus, which is sometimes found collected in them. In a case of old syphilitic ulceration, I have found one of the sacculi not only filled with pus, but its cavity distended, and its mucous lining thickened*. It is by no means uncommon for these follicles to be enlarged, and for their orifices to be discoloured by blackish matter.

Warts in the
larynx.

Warts are said, by Dr. Baillie, to be sometimes formed upon the mucous membrane of the larynx and epiglottis. Their production, however, must be of rare occurrence, since not a single instance has occurred to myself. Those soft excrescences known by the name of polypi have also, though rarely, been met with in the larynx.

Fungoid growths such as I have already described, in the form of long and slender filaments, have also been met with on the mucous membrane of the larynx. A very different appearance is produced when malignant disease takes its origin in the follicular structure; for we have then more or less circular ulcers with elevated edges.

Diseases of
sub-mucous
cellular
tissue.

Œdema
laryngis.

The submucous cellular structure at this part of the air-tube sometimes becomes the seat of morbid affections of the greatest severity and danger. The most remarkable of these is the inflammatory œdema of the glottis and epiglottis. Many, if not most, of the examples of this disease have occurred in persons who, being affected with syphilis, have been subjected to ptyalism, during the continuance of which they have been exposed to cold. Renal

* Although the extent of the cavities formed by these sacculi was known to Galen, whose name they bear, it appears to have escaped the attention of most modern anatomists. These sacculi have, however, been recently examined and described by my friend J. Hilton, Demonstrator of Anatomy at Guy's Hospital; and I must refer the reader to his Paper published in the Reports of that Hospital. It is by no means improbable that the deeper-seated portions of these sacculi, and the glandular apparatus with which they are well supplied, may, in some cases, have furnished the collections of pus above mentioned.

disease, accompanied by coagulable urine, likewise predisposes to this affection. The disease in general is extremely sudden in its invasion; and the symptoms which accompany it bear a great resemblance to that form of laryngitis which is accompanied by a plastic effusion, in the form of a false membrane. The voice is greatly perverted, or lost; and the dyspnœa is most urgent, amounting at last to complete suffocation, by which the patient is carried off. On inspection, the affected parts are found so greatly tumefied, as very nearly, if not quite, to effect the total obstruction of the passage; yet the mucous membrane exhibits very little alteration in colour or texture. On making an incision into the swollen parts, the tumefaction is found to be occasioned by the infiltration of the subjacent loose cellular structure; and on pinching it between the fingers, a colourless transparent serum is expressed, after which the parts resume their natural appearance. It must, doubtless, be of great importance, to be able during life to distinguish these cases from those of croup, accompanied with a production of false membrane; since the treatment applicable in the one case will probably be worse than useless in the other. Were it possible to effect a slight scarification of the œdematous parts, not only immediate relief, but permanent advantage, would probably be derived from it; and, at all events, the timely employment of tracheotomy ought not to be neglected: but in the case of a plastic effusion lining the air-passages, even temporary relief can scarcely be expected from any operation. It would also seem, *à priori*, that different medical treatment would be required in the two cases. The sub-mucous cellular membrane of this part is sometimes distended with pus; which is either collected in small isolated spots, or formed in larger quantities, occasioning a degree of swelling very similar to that which is met with in cases of œdema. This is, perhaps, most remarkably seen in the cellular structure on the upper surface of the epiglottis. But it is, at times, by no means

Suppuration.

circumscribed, but found diffused to a greater or less extent.

Scrofulous
tubercles.

Scrofulous tubercles are likewise formed in the sub-mucous tissue of this part.

Disease of
the carti-
lages.

When the diseases of the larynx become chronic, it by no means unfrequently happens that the cartilages, with their ligaments and capsules, are implicated in the derangement; sometimes becoming ulcerated, and at others loaded with scrofulous and cretaceous matter; or, if they have previously proceeded to ossification, necrosis and exfoliation may take place.

These deposits sometimes communicate with the internal, and at others with the external surface.

Wounds.

The larynx is not unfrequently the subject of wounds, which, in most instances, are inflicted for criminal purposes, by the hands either of a suicide or of an assassin. We may then see the natural bright red colour of the mucous membrane, which after death is generally very pale. Such wounds often prove as fatal from the injury of important parts in the neighbourhood, as from the violence done to the larynx. Sometimes a large artery produces fatal hæmorrhage: sometimes the blood, flowing in a less considerable quantity, produces suffocation, by entering the air-tube: and probably suffocation is as often produced in this way by such wounds, as by the impediments to respiration afforded by the altered condition of the tube. When the wound is too considerable to admit of recovery, it may yet allow of the continuance of life for many weeks; and the patient appears to sink under the indirect effects of irritation, rather than from the direct effect of the disturbed functions of the injured part.

Trachea and
bronchi.

I shall now proceed to speak of the second portion of the mucous membrane of the air-passages, or that lining the trachea, the bronchi, and their principal ramifications. The affections of this portion, as you may well suppose, bear the

closest resemblance to those which I have just described as taking place in the larynx; which I thought it right to consider separately, only in consequence of its greater complication, and of its special function in the production of the voice.

The ciliary movements described by Dr. Sharpey have been satisfactorily demonstrated upon the surface of the mucous membrane of the air-passages in frogs and other animals, when recently killed; and their supposed use in carrying forward the secretion receives some support from their marked existence in these canals, which can admit of little or no movement of the peristaltic kind, and yet essentially require the removal of the redundant mucus. It is necessarily impossible, or very difficult, to determine how these movements are influenced by disease; but it is obvious, that the secretion may be so increased in quantity, or altered in quality, that these delicate movements must be wholly inadequate to effect its expectoration, since even the most violent coughing excited for that purpose is unable to do so.

Ciliary movements on this portion.

Malformations of the trachea and bronchi are extremely rare, and almost wholly confined to irregularities in their division and relative position. A congenital contraction or obliteration of the trachea or bronchi is stated by Meckel to concur with acephalous monstrosity in the fœtus. An acquired contraction of a bronchus is sometimes produced by disease. Although we meet with some varieties in the size of the trachea, they may be referred, for the most part, to sex and period of life. I am not aware of any instance of this part being pathologically increased in size. The trachea may be compressed by tumors. I have seen this the case in consequence of malignant growths in the œsophagus. Andral describes a case in which the right bronchus was so much contracted for a short distance a little beyond the bifurcation, that a small probe was with difficulty passed through the remaining aperture; beyond

Congenital and acquired anomalies in size and form.

Contraction and dilatation of trachea.

which the tube possessed its ordinary dimensions. This obstruction appeared solely to depend on the mucous membrane, which was red and much thickened. Andral remarks, that this thickening was completely analogous to the partial thickening which is met with in the mucous membrane of the intestines. The substance of the lung, though tolerably healthy, was little crepitant. During life, the patient had been sensible that he did not breathe with the right side of his chest. In another case, he met with partial contractions, with thickening of the membrane in conjunction with phthisis and bronchial inflammation. The bronchial tubes necessarily participate in the contraction which takes place in portions of lung which have been the seat of some forms of pneumonia. The calibre of the bronchial tubes is sometimes contracted by tumors, which compress them: these may be tuberculous, fungoid, or melanotic; of which last form Andral has given an example. The same effect may be produced by an aneurism.

Bronchi contracted, compressed by tumors, &c.

T. W. King's observations.

My friend T. W. King has shewn that the compression of the left bronchus frequently attends the dilatation of the cavities of the heart, and more especially the left auricle; but his researches have not as yet discovered that any derangement of function is produced by the degree of contraction which he has, as yet, met with from this cause.*

Fistulous openings into the trachea.

Abscesses sometimes cause ulceration of the trachea from without, inwards; and produce more or less permanent fistulous openings into the air-tube. Such cases chiefly occur in children, in consequence of scrofulous enlargement of the cervical glands.

Dilatation of the bronchial tubes.

Under the head of deviation from the healthy state of the bronchial tubes consisting in excess, must be mentioned the dilatation of these passages. I believe that the first published notice of this pathological condition was that given by Laennec, in his treatise *On Mediate Auscultation*.

* See Guy's Hospital Reports, No. VI. p. 157.

Although he had at that time seen but few instances of the affection, he gave not only a good account of its characters, but his sagacity had led him to discover some of the most important points connected with its symptoms and causes. His facts and views on this subject have been confirmed and extended by Andral, Louis, and other pathologists, whose attention has been directed to the diseases of the respiratory organs.

In inspecting the lungs, the condition of the bronchial tubes should be examined, by laying them open with a pair of scissors, commencing at the bifurcation of the bronchi. I have almost invariably adopted this method; and in so doing, I have by no means unfrequently found, that the bronchial tubes, instead of becoming progressively and rapidly smaller as they subdivide, present such dimensions, that the subdivisions nearly or quite equal in size the tubes from which they are given off. This state, of which there are many varieties, in the amount of dilatation, in the number of tubes affected, in the condition of their parietes and of the neighbouring pulmonary texture, constitutes the first form of bronchial dilatation, in Andral's division of the subject. It is obvious, that the mere examination of the lung by incision would be very likely to allow the oversight of this derangement, except where the dilatation is very considerable, or where it extends to a part of the lung in which a tube of considerable size cannot exist in the healthy state; as, for instance, when it is found near the edge or base of the lung. Laennec, however, observes, that we may be led to suspect it when, on making a section through a lung, we find mucus escaping from the divided tubes. In this first form it does not often happen that the dilated branches exceed the size of a common quill, and of examples of this size I have myself met with very few instances; but it is stated, that such tubes, at times, equal the primary and secondary divisions of the bronchi. Sometimes but a few branches are dilated, and these may occur in one or diffe-

First form
of the affec-
tion.

rent lobes: in other instances, it is pretty general in the tubes of a particular lobe: and when it has extended further, it may be confined to one lung.

State of the
mucous
membrane.

The mucous membrane in the dilated tubes is sometimes pale; but more often stained of a livid colour, of different degrees of intensity. It is sometimes softer than is natural; and Laennec has described it as susceptible of being scraped off with the handle or back of the scalpel. Ulceration has also been found co-existing with dilatation. He remarks, that the appearance of fibres subjacent to the mucous coat is lost where dilatation exists; but this is a circumstance which must evidently be modified by the extent to which the derangement has proceeded. In the slighter and more frequent forms, I cannot assert that there is any change in the appearance of the lining membrane to arrest the attention even of the practised observer. There is great variety in the condition of the textures subjacent to

Condition of
the sub-
mucous tex-
tures, and
neighbour-
ing portion
of lung.

the mucous membrane. Sometimes the parietes of the tubes are so thin, as to seem to consist of nothing but the mucous membrane; which is readily pierced by the scissors employed in opening them, if their points are not guarded. In other cases, there is such a thick and firm cartilaginous envelope to the mucous membrane, and it possesses so much of the natural character of that which belongs to the larger branches, that the affected tubes may easily be mistaken for them, if attention be not paid to the part of the lung in which they exist. Sometimes the cartilaginous thickening is more continuous, and in others more partial, occurring in patches: more rarely it is accompanied by spots of bony or earthy deposit. Again, there are cases in which the mucous membrane is intimately attached to a dense structure; which, instead of being proper to the bronchial tube, seems rather to belong to the pulmonary texture; of the condition of which, in connexion with dilatation of the bronchi, I have next to speak. This tissue is often but little sensibly altered in the immediate neigh-

bourhood of the dilated tubes: this, indeed, I believe to be generally the case, where the affection is slight and recent; and so far from possessing any remarkable power of resistance, it readily permits the point of the scissors to pass along the side of the tube, when it has escaped in the manner against which I have already warned you. When the affected tubes, either by their number or by the extent of their dilatation, have materially encroached upon the pulmonary tissue, it is found compressed, and more or less void of air, and in a state which Laennec compares to that of a lung rendered useless by pleuritic effusion. The part of the lung thus compressed may be not merely deprived of air; but it may even acquire an extremely dense and almost cartilaginous character, which, as I have just stated, becomes intimately and inseparably united with the membrane lining the tubes. It seems that this consolidation of the pulmonary texture in the neighbourhood of dilated bronchial tubes may be sufficiently extensive to occasion a dull sound, on the percussion of that part of the chest in which they are situated. I cannot state this from having noticed any thing of the kind myself; but I mention it on the authority of a no less practised and accurate observer than Professor Louis. In more than one instance which has come to my knowledge, he has been induced to form the diagnosis that such was the case, in patients exhibiting this symptom accompanied with doubtful pectoriloquism near the apex of the lung;—an opinion which he would not have hazarded, had not repeated inspections confirmed the probability of such a conjecture.

Observations of Prof. Louis.

The secretion within the dilated tubes admits, like the tubes themselves, of a notable variety in its characters: sometimes it is nearly white, but thick and viscid; sometimes it is sanguinolent; at others, more or less puriform, or even consisting of perfect pus; sometimes it is inodorous; at others, more or less offensive, which character it may possess to such a degree as to excite suspicion of gan-

Condition of the secretion in conjunction with dilatation of the bronchi.

grene; sometimes cretaceous or earthy matter has been found in a dilated tube. These varieties in the secretion belong to the different forms of dilated bronchial tubes; and are not confined to the first, of which I have hitherto been speaking: indeed, some of them seem more especially connected with the forms which I have yet to notice.

Second form
of the affec-
tion.

The second form, according to Andral's division, is that in which a local or partial dilatation takes place in one or more tubes. In these cases, instead of finding the tubes divide without diminishing in size, we find an absolute dilatation taking place as we advance from the trunk. Cavities are thus formed, capable of holding a nut, or an almond, with its external shell. They form *culs-de-sac*; and have been compared to the fingers of a glove; to which they may bear some slight resemblance, where several contiguous tubes are thus affected. It is remarkable, that the dilatation, however considerable, does not extend beyond the bronchial tubes into the cellular structure; and we find the cavities lined by smooth mucous membrane, with more or less numerous undilated tubes opening into the cavity. As respects the condition of the parietes of the cavity, and of the adjacent pulmonary structure, we may observe similar varieties to those which I have mentioned as accompanying the first described form; except that it is very unlikely that these partial dilatations, occurring for the most part near the extremities of the bronchial tubes, should ever possess a cartilaginous covering resembling the rings belonging to the larger tubes. The contents of these cavities likewise present the varieties already mentioned; but fetid mucus and pus seem more particularly to belong to them. The latter secretion is most frequent in the lungs of children, which seem to be especially subject to the acute form of this dilatation; which causes the affected organ, when cut into, to appear to contain numerous small abscesses.

Third form
of the affec-
tion.

The third form, which I believe to be the most rare, con-

sists of numerous alternate dilatations and contractions, or, at least, portions in which dilatation is absent along the course of one or more tubes. It produces an appearance which has been compared by Laennec to the podded leaves of the *Fucus visciculosus*. This form, like the preceding, is found in the lungs of children; and the cavities which they form are filled with pus or puriform mucus.

The circumstances which appear to have attended the production of these derangements of the bronchial tubes may lead us to form some conjecture as to the modes in which the different forms and varieties are brought about. One of the most remarkable, and one of the first causes pointed out by Laennec himself, is the occurrence of long-continued fits of coughing; such as are well known to take place, and to be often repeated, in patients affected with whooping-cough. It is obvious that the effort employed in forcing the air upwards through the trachea and larynx must also, in degree, be exerted downwards upon the bronchial tubes; although it is resisted by the contraction of the chest, and the want of exit for the air in that direction. If, however, the expulsive effort be great, and some impediment exist to the passage of the air by the larynx, a proportionably greater force must be exerted upon the bronchial tubes: and if one of these admit the air more freely, or be weaker than the rest, a greater or less degree of temporary dilatation will be likely to take place. The repetition of the cause increases the effect: the dilated state becomes permanent; and as is, I believe, almost uniformly the case with other cavities in the living body, the readiness to yield to the dilating force and the incapability of contraction progressively increase. It is when this change is gradually brought about by a process protracted for some years, as in the case of whooping-cough succeeded by chronic cough, that we are likely to find the dilated tubes possessing thickened parietes resembling those of the superior branches. Such appeared to have been the

case in the example which I have already related, in the lad who furnished the specimen No. 1717.* The induration of the pulmonary texture in the neighbourhood of the tubes, which also belongs to the cases of long standing, is a proof that inflammation has extended to that tissue, which has probably suffered in conjunction with bronchitis specially affecting the dilated tubes. In those cases in which the neighbouring pulmonary texture is simply void of air, and flaccid, it appears that inflammation has not been concerned in the change; which is solely to be attributed to the encroachment and pressure of the dilated tubes. It is obvious, that the cause of dilatation, which I have just noticed, is most likely to produce the first form of the affection.

Another cause of dilatation is to be found in the secretion of the bronchial membrane, which, from its viscidty or abundance in particular tubes, may fail to pass from the smaller to the larger branches. The same principle influencing progressive dilatation, which I have mentioned as exhibited in conjunction with the first-stated cause, must also co-operate with that which is now under consideration; but with this difference, that the altered secretion being, for the most part, the result of the inflammatory condition of the membrane, the resisting power of the texture is likely to be still further impaired. It is this mode of distension which appears to be the chief, if not the sole cause of the second and third forms of dilatation of the bronchi; and it is in these that we accordingly find the cavities filled with fetid mucus or pus. It is also from this cause that the dilatation is likely to be the most rapidly produced: and from being accompanied by sufficient derangement of health to cause death, it is also likely to furnish cases which may be inspected in the recent state: hence the parietes of the cavities are often thin and flaccid. Nevertheless, in the second form, the affection may become chronic; and the

* See Case, Vol. I. p. 374.

alterations, both in the dilated portion of the tube and in the adjacent structure, may take place.

With regard to the causes predisposing to the dilatation of the bronchial tubes, there is a question worthy of consideration; viz. Why is the alteration of structure generally partial, affecting one lung, one lobe, or a few tubes, or even a single tube, when some, at least, of the exciting causes must be generally exerted?—and, Why does the distending cause cease to operate in the tubes, and not extend to the minute, delicate, and apparently weaker texture of the pulmonary cells, when we know that, in other cases, they become the subject of dilatation from very similar causes, constituting the state called ‘emphysema of the lung’?

The cause which Andral assigns as predisposing to dilatation of the bronchi—viz. that there exists a peculiar perversion of the vitality of the part—scarcely amounts to an explanation; yet it seems to point to a particular local weakness, which it may not be useless to admit, rather than always call in the assistance of inflammation, so generally had recourse to for the explanation of morbid changes. Although I cannot pretend to clear up the mystery, it may not be amiss for me to adduce somewhat analogous alterations of texture occurring in another organ, and in which a parity both of reasoning and investigation seems to be required. In the kidney and its appendages we have the cortical part, the tubuli, the infundibula, pelvis, and ureter; in each of which, dilatation may take place singly or conjointly, in consequence of causes impeding the passage of the secretion. Sometimes these differences may be obviously ascribed to the situation of the obstruction. A tumor may compress the ureter against the brim of the pelvis, and occasion the upper part of the tube to be dilated almost to the size of the small intestine. Though, in these cases, the pelvis of the kidney is generally simultaneously dilated, there is often no such affection in the kidney itself, either in the tubular or cortical part. Sometimes the obstruction

is caused by a calculus, which, in its descent from the kidney, has become impacted in a part of the ureter, so as at once to account for dilatation above, and contraction beneath it: but at other times we meet with dilatation of the pelvis and infundibula, the ureter at the same time being little affected, and the glandular structure very much wasted. In those cases in which the obstruction takes place at or near the bladder, and dilatation occurs not only in the ureter but extends to the kidney itself, this organ may either present very numerous and general dilatations both in the tubuli and cortical part, so that the distended organ almost resembles a bunch of grapes; or there may be only a very few cavities, or even a single cyst. Again, we meet with cases in which the dilatations occurring in the substance of the kidney, whether numerous or few, have taken place without any derangement in the infundibula, pelvis, or ureter. In some of these examples we may refer as a cause to the state of the secretion itself, which we may find thick and viscid, like honey or turpentine, or thick and turbid, and variously coloured, or in other cases puriform; but in other examples, there is nothing, either in the secretion or in the texture of the gland itself, as far as our means of examination have yet discovered, to account for the distension, the yielding to which has converted tubes into cysts.

Although there is little danger of mistaking dilated bronchial tubes in the dead subject, when the examination is made in the mode which I have pointed out, by laying them open from the principal branches, yet, when we come upon them by sections into the substance of the lung, they may be mistaken for abscess in the lung, as I have already hinted; or for an excavation produced by the softening and expectoration of a tubercle, to which the resemblance is particularly close, when the dilated tube and the surrounding pulmonary texture have become indurated. If the section be made near to the spot at which several

dilated bronchial tubes unite, the appearance which they present is almost precisely that which is seen on the section of a multilocular tuberculous cavity. Yet, even in these cases, error may be avoided, by tracing the tubes to a short distance, after the section has been made.

The secretion of this part of the air-tube is liable to variation in quantity and quality. In the most healthy state of the membrane, it is probable that the quantity of secretion is little more than sufficient to keep the surface slightly covered with transparent mucus, but moderately viscid; and the redundant portion, if any, is parted with imperceptibly. An increase in quantity and viscosity, which seems to be one of the effects of advancing years, produces occasional cough and expectoration, which can scarcely be considered as disease.

Of the secretion of this portion of respiratory mucous membrane.

The state of the atmosphere, likewise, influences the secretion of this part, which is constantly and peculiarly exposed to its influence. A very dry state of the air is prone to produce catarrh in those individuals in whom the secretion of mucus of this part is easily affected. It would appear that even hæmorrhage may be produced from this cause.

The secretion of the bronchial mucous membrane is sometimes morbidly deficient in quantity, constituting what Laennec has called '*catarrh sec*'; a term which, etymologically, is so paradoxical, that it is really wonderful that so philological a physician, as Laennec certainly was, could have introduced it. It produces considerable dyspnœa, and characteristic sibilant rhoncus. This affection very rarely causes death; and it is, consequently, out of our power to describe the appearance of the membrane which attends it: but by watching the affection, we may be convinced of its connexion with the other forms of catarrh; to which, from the increase or perversion of secretion attending them, the term '*catarrh*' is strictly applicable.

Deficient secretion.

The continuance of the suppression or diminution of the

bronchial secretion is one of the preludes to that form of emphysema of the lungs which consists in dilatation of the air-cells.

Increased secretion.

An increase in the secretion from this part of the mucous membrane of the air-passages may co-exist with an alteration in its properties, rendering it more fluid, or more thick and tenacious than in the healthy state. The former accompanies an affection of the substance of the lungs: to which I shall have to call your attention on a future occasion, when speaking of œdema of the lung. It must, in fact, be almost impossible to ascertain the precise source of this serous effusion. It is stated, by Andral, that a copious, watery secretion, constituting a true bronchial flux, has been observed to take place in conjunction with the absorption of the fluid in hydro-thorax.

I believe that a very general increase of the secretion of the bronchial mucous membrane, sufficient to produce almost universal mucous rattle, and a corresponding difficulty of breathing, imminently threatening or even causing death, may be occasioned by an irritating cause, the direct application of which may be very partial: just as a foreign body irritating a small part of the conjunctiva or Schneiderian membrane is seen quickly to produce a copious flow from the eyes and nose. I have more than once seen a patient labouring under chest affection, in whom the organic lesion seemed evidently to be confined to a small part of one lung which was regarded as in a state of inflammation of some weeks' standing—in whom the expectoration of sanguinolent and otherwise discoloured sputa, probably proceeding from that part, was quickly followed by the most distressing dyspnoea, attended with universal mucous rattle, pale and livid countenance, cold and clammy skin, and extreme prostration of strength, threatening immediate dissolution—in whom these alarming symptoms gradually subsided, the mucous rattle becoming less marked, and the derangement of the respective organs again appearing to

be confined to the part originally affected, and its immediate vicinity. The alleviation of this state of dyspnœa, which in its characters very much resembles extreme cases of some forms of asthma, may be attended by expectoration unloading the bronchial tubes; yet the promptness of the relief, and the apparent inadequacy of the amount of sputa, render it highly probable that the mitigation of the symptoms is, in fact, to be ascribed to the absorption of the fluid from the bronchial tubes. The experiments of Meyer, Majendie, and others, have clearly proved that very active and rapid absorption may take place from these cavities.

Blood is sometimes poured out from the bronchial membrane; causing as profuse hæmoptysis as that which takes place in consequence of ulceration in phthisis or from pulmonary apoplexy. I have seen such hæmorrhage concurring with severe and fatal bronchitis. On inspection, neither tuberculous cavity, nor pulmonary apoplexy, nor recent pneumonia, was detected, to introduce any doubt as to the bronchial source of the hæmorrhage.

Hæmorrhage from the bronchial membrane.

The bronchial mucus sometimes acquires an extremely fetid and offensive odour. In this state, it is often connected with gangrene of the lung; but it may exist without this complication, and may be merely the result of retention, especially when preternatural cavities exist in the lung. I have noticed some examples of this kind, in speaking of dilatation of the bronchi: others are met with in consequence of tubercular phthisis, and as a sequel to some forms of pneumonia.

Secretion sometimes remarkably fetid.

I believe that there are derangements in the quantity, quality, and movements of the secretion of the bronchial membrane, causing various forms of dyspnœa, which the rarely fatal character of the maladies in which they occur does not admit of our elucidating by actual inspection; yet we may reasonably hope that improved acquaintance with the symptoms which auscultation gives us the means of

observing may ultimately remove much of the uncertainty which attends them.

Probable
secretion of
air by this
membrane.

It is not easy to ascertain whether air is ever secreted by the bronchial membrane; yet strict analogy with what takes place in the mucous membranes in other situations would lead us to suppose that this may be the case: and it seems not improbable that such an occurrence may give rise to dyspnoea, accompanied by little perceptible perversion of the respiratory sound, as heard with the stethoscope.

In chronic catarrh, the mucus is sometimes secreted in great abundance; and is so extremely viscid, as to be expectorated with difficulty; and forming long and tenacious ropes, when poured from vessel to vessel. It may be nearly transparent; or its colour may exhibit various shades of yellow, green, and grey, the last sometimes passing almost into black. Most of these shades belong to an inactive and chronic form of inflammation. The yellow shades seem to belong to the mucus itself; but the green and the grey appear to depend upon the membrane by which they were secreted; or with which they may have been in contact.

Andral relates a case in which the scissors met at the origin of a large bronchial tube a mass of concrete half-solid mucus, which closed it like a stopper. The patient died with dyspnoea, causing asphyxia. The respiratory sound had been absent on the right side anteriorly, corresponding with the obstructed tube. The same part was resonant on percussion. In another case, the concrete mucus extended, like polypous and vascular concretions, into three or four principal branches.

Inflamma-
tion of the
larynx and
bronchi.

I have already mentioned a case which shews that the plastic form of effusion sometimes accompanies the inflammation of this part of the membrane, as well as that lining the larynx; and I have only to add respecting it, that this affection, to which the name of *angina polyposa* has been given by Michaelis, has been known to assume a chronic form, in

which a succession of tubular false membranes has for several weeks been produced and expectorated. On a cylinder of lymph thus produced in the trachea, we may observe the small round impressions of the mucous follicles; whence we may infer, that whilst the membrane itself has been in that state of active inflammation necessary to produce plastic lymph, the follicles have been but little, if at all affected; and it is probably to their secretion that we must attribute the total want of adhesion between the mucous membrane and the false membrane investing it, notwithstanding the latter may have been several inches in length. It is very rarely that, in the human subject, any portion of the plastic effusion becomes organized and permanent; but in the inferior animals, and more especially in the horse, such an occurrence is not very uncommon, and constitutes the essence of that affection which exists in those horses which are called Roarers.

In the more common forms of inflammation of that part of the membrane which we are now considering, and to which the terms bronchitis and catarrh are generally applied, we find the membrane extensively reddened, thickened, and softened. The redness is sometimes diffused; but often more intense in spots as well as in streaks, determined by the cartilages of the trachea. If the disease has been of long continuance, the membrane becomes minutely granular. In these cases, that lining the subdivisions of the bronchi sometimes resembles deep red velvet. The mucus covering it is altered in quantity and quality, being at first either greatly diminished, or rendered thin, watery, and acrid; in which case it is at times copious. It is afterwards transparent; and though more firm, less tenacious than in health. It subsequently becomes opaque, thick, and ropy, and sometimes ultimately puriform. Either from its abundance, or from the difficulty with which it is expectorated, the bronchial tubes become more or less clogged with this substance. Hence, when, as not unfre-

Appearance
of the in-
flamed
membrane.

quently happens, the air-cells but little, if at all, participate in the affection, the air which they contain is prevented from escaping through the obstructed tubes; and the pulmonary structure, in consequence, feels somewhat like dough between the fingers. On making an incision through a lung, of which the bronchial tubes are in this state, the puriform secretion is seen to exude from numerous points, and gives rise to one of the appearances which have been mistaken for suppuration of the substance of the lung. In such cases, a minute examination will easily convince us that the purulent matter is contained in the ramifications of the bronchi, the minute divisions of which are, at times, considerably dilated by their contents. In the small branches thus filled, the mucous membrane beneath the purulent secretion is often quite pale; and the surrounding soft and doughy pulmonary structure is so far from being gorged with blood, that it is only of a light pink or flesh-colour, except where spotted by black pulmonary matter.

Differences
as respects
sanguineous
injection.

The different degree of injection, not only of the bronchial lining, but of the pulmonary texture, in cases of fatal bronchitis, is remarkable and interesting. I suspect that this difference may be in some degree attributed to the treatment employed; and that the paleness of the mucous membrane, and the want of congestion in the pulmonary tissue, in some cases in which the bronchitis has been both acute and extensive, may be owing to the depleting measures which have been used, and more especially to copious venesection.

Lividity ac-
companying
bronchitis.

The general turgescence of the venous system, and the deep lividity accompanying it, are, I think, more frequent and remarkable in conjunction with bronchitis, acute and chronic, than in almost any other affection; not excepting the blue disease dependent on malformation of the heart, which cause I have repeatedly known to be suspected, when the lividity was really dependent on bronchitis.

In connexion with the state of the venous system in

bronchitis, it may not be amiss for me to introduce one practical observation, the rationale of which, I confess, I do not clearly understand. I allude to the great relief which, in most cases of dyspnœa from bronchitis, may be obtained from the employment of cupping between the shoulders. The alleviation thus obtained seems to be more salutary, and also more immediately perceived by the patient himself, than when blood is taken from the arm. This could hardly have been expected *à priori*; since the abstraction of blood from the arm, from being more rapid, would seem much more calculated promptly to relieve the loaded right side of the heart.

Practical observations.

Though venesection may doubtless be a salutary, and even essential mode of treatment, in cases of bronchitis occurring in plethoric subjects, yet it has appeared to me that its repetition in patients of a different class has been rather injurious than beneficial. It is this conviction which induces me here to urge the importance of preferring the use of the cupping-glass. I ought to state, that my attention was first led to notice this fact by the result of this mode of treatment under the direction of Dr. Addison; and the conclusion to which I then came has been confirmed by more than twelve years' subsequent experience. Let me take this opportunity of cautioning you against another mode of treatment, which, though not unfrequently employed in bronchitis, I am persuaded is opposed both by theory and practice. I allude to the use of mercury given so as to produce ptyalism. The obvious effect of this remedy is, to increase the fluid secretions, and induce a sort of general colliquative state. The bronchial lining participating in this influence, becomes still further loaded with the secretion by which it was previously oppressed: such, at least, is the explanation which I am induced to adopt of the manifest failure which I have witnessed in cases of bronchitis treated with mercury.

The reasoning which I have here employed with regard

to the use of mercury in ordinary cases of bronchitis seems to explain its entire compatibility with those cases of inflammation of this part of the mucous membrane of the air-passages in which the product of inflammation is of the plastic character—cases in which experience sanctions our regarding it as the grand remedy.

When the trachea and bronchi have been long affected with chronic inflammation, the longitudinal fibres in the course of these tubes often become strongly marked, and have been by some considered as indicative of muscular structure; but respecting their nature I will not attempt to decide. Analogy, however, seems to favour the existence of a contractile fibrous structure subjacent to the bronchial lining.

Ulceration
of tracheal
and bron-
chial mucous
membrane.

Ulceration is not very unfrequent in the trachea; but I have seldom met with it in the bronchial tubes, except at the points where softened pulmonary tubercles have made their way into them. Laennec confirms the rarity of the ulceration in the mucous membranes of the bronchial tubes, yet informs us that it does occasionally exist; and is produced, as he supposes, by the softening of small tubercles beneath the mucous lining. In one case, Andral found little ulcers, with thickened edges, in the small branches of the bronchi. Professor Louis and Dr. Stokes appear to have met with bronchial ulcers more frequently. The ulceration of the trachea occurs most frequently as a concomitant to phthisis, of which it may be either the forerunner or the sequel. I apprehend that it is more commonly the latter; and this observation is confirmed by Louis, who believes that such is invariably the case. These ulcers are generally small, well-defined, and circular, with clean cut edges; often attended with little discolouration, and scattered irregularly over different parts of the membranes. Such ulcers probably commence in the follicular structures. Sometimes the production of ulceration, and the form which it assumes, is determined by the rings of

the trachea, when the affection bears some analogy to a similar state of the *valvulae conniventes* of the small intestines. The ulceration of the mucous membrane of the trachea may proceed for a considerable time, imperfectly healing in some spots, whilst it is extending in others: in which cases, we find, after death, the membrane somewhat puckered, indurated, and irregularly thickened. At other times the affection is more partial, occurring in one or more spots, of about the size of a sixpence or a shilling; at which the membrane is thickened, reddened, and highly vascular. Such spots are generally, if not always, found at the posterior part, and give rise to symptoms like those of stricture of the *œsophagus*. Indeed, so closely does it resemble this latter affection, that I have known a patient admitted into the hospital with the idea that he was labouring under it, who died a day or two after, and was found, on examination, to have been carried off by the most advanced stage of phthisis, and with a highly inflamed spot of the kind which I have just described, opposite to that part of the *œsophagus* at which the stricture was supposed to exist; while this latter canal was perfectly healthy. Sometimes the ulceration of these spots proceeds so far as to produce a large opening, by which the two passages communicate with each other. In such cases, deglutition must necessarily be extremely difficult: yet cases prove that it is not altogether impracticable: I have known one or two in this hospital. Andral, who has noticed others, states, that in one patient, in whom communication between the two tubes existed, there was but slight cough and dysphagia. Cayol had, before Andral, described ulcers in the trachea of various sizes, situated most frequently in the lower part of the tube near the bifurcation, and having elevated edges, surrounding a discoloured, grey base, covered with puriform matter.

I have but little to say respecting the affections of the mucous follicles of this part. In conjunction with the

Affections of
the follicular
structure.

chronic inflammation of the membrane, these structures become enlarged, and pour out an increased quantity of thick and viscid mucus. One of the most remarkable illustrations of this fact occurred in a middle-aged man who died of severe catarrh. The reddened and highly vascular trachea was thickly covered with opaque, pearly drops of mucus.

Polypous,
malignant,
and other
diseases of
the trachea
and bronchi.

Polypi sometimes form in the trachea. Neither the membrane covering this part, nor the cellular structure subjacent to it, are often the subject of malignant or other heterologous deposits.

The following case, in which the affection of the trachea appeared to be secondary, is the most remarkable instance of the kind which I have myself met with:—

7. 5. 1835. — EXAMINATION OF THE BODY OF C. C. —.

This gentleman was about sixty-two or three years of age: he was rather tall than otherwise, and of a remarkably fair complexion. When in health, he was spare, without being at all emaciated. He had from early youth been closely occupied in business, the weight of which he had been long accustomed to sustain. He had also joined much in company, at a time when more wine used to be taken at table than is now generally the case; and had, consequently, habituated himself to take it without experiencing inconvenience at the time. It is proper to state, as probably bearing on the nature of his complaint, that a few years before his death circumstances occurred which occasioned him painful and continued anxiety. Between two and three years before his death, he had a severe pulmonic attack, attended with general febrile symptoms, which reduced him greatly, and endangered his life. He had for many years been subject to a small fistula near the anus, and he had some tendency to hernia. His bowels required the constant assistance of medicine; and he was much annoyed by flatulence, or by symptoms attributed to that cause. About nine or ten months before his death, he began to observe that he had occasionally some difficulty in swallowing: a spasm seemed to arrest the descent of the food, and oblige him to repeat the effort. It did not either interfere with his daily attention to business, or produce any sensible effect on his general health; but his voice was at times a little perverted, being attended with a kind of squeak, which appeared to depend on the throat. About the end of last year, or the beginning of the present, his general health materially gave way: he had distressing

dyspeptic symptoms, and his constitution appeared likely quickly to break up. A very careful attention to regimen, with a little medicine calculated to assist the stomach and bowels, appeared to improve his general symptoms; but the difficulty in swallowing greatly increased; the voice became more considerably and constantly perverted: there was also cough, and a little expectoration. After a while, the voice improved; although the cough, difficulty of swallowing, and distressing sensation of flatulence, accompanied with some pain under the sternum, still continued. A few weeks before his death, a new symptom occurred, in the remarkable tendency to fulness in the veins of the head, accompanied with unusual prominence of the eyes: this symptom was most urgent in the morning, and subsided, to a great degree, towards the evening. The nights became distressing, from dyspnoea and restlessness; and various anodynes were resorted to. He was latterly quite confined to his bed; but could, at times, swallow sandwiches cut very small and thin. There was no swelling of the legs; but one or both hands latterly participated with the face in exhibiting a little oedema. The body was emaciated, but not extremely so.

The head was not examined.

The cartilages of the ribs were so completely loaded with bony matter, as almost to resemble the ribs themselves. There were numerous old adhesions of the pleura, on both sides. Both lungs were extremely oedematous, so that in some parts they resembled a fine sponge filled with water. A considerable part of the right lung was in a state of recent hepatization, which appeared to be the result of *pneumonia* of the moribund. In the midst of this part, a small portion approached to a state of gangrene, and was highly offensive. There were two or three small collections of well-formed pus; one of which, situated anteriorly, and very near the base of the lung, was so superficial, as to have formed a communication with the pleura; which at this spot, and at the base, exhibited marks of recent inflammation. In the latter situation, in particular, there was a pretty thick layer of recent lymph, with little or no serum: the summit of this lung was of a dark grey or slate colour, and considerably, but partially, indurated: it contained a few small and circumscribed cretaceous remains of old tubercles: there were also several small but thickly-placed recent tubercles, which appeared to be of malignant character, closely resembling that to be hereafter described. This part of the lung was so firmly adherent to the pleura, that a small portion remained attached to the chest, when the rest of the lung was taken out. The left lung was of a darker colour, and generally of a softer texture, and more lacerable, than the right: it appeared to have softened, and become gangrenous, without exhibiting much of the character of recent hepatization; yet, amongst this lacerable mass, nume-

rous irregular portions, of a dark slate colour, retained a preternatural degree of firmness, which appeared to be the result of ancient pneumonia. There were not the same marks of recent pleuritis on this side as on the right. The bronchial tubes had remarkably dense and resisting parietes; and the lining membrane appeared red and thickened. The larynx, trachea, pharynx, and œsophagus, being the parts claiming special attention, were removed together, and must be described in connection. The upper part of both tubes appeared healthy: the cartilages of the larynx were all but ossified: the rings of the trachea were remarkably firm, and drawn together; so as, in many instances, to overlap each other, and almost to give to the larynx the character of a solid bony tube. The mucous membrane was remarkably thick and corrugated, especially at the posterior part, where its numerous plicæ approached the longitudinal direction; but their course was somewhat disturbed by the contraction which had evidently taken place around an ulcerated spot, which was in an inactive state, and reduced to the size of a grain of hemp-seed: it had not completely formed a communication with the œsophagus; but this was nearly the case. The colour of the mucous membrane of the trachea, and lower part of the larynx, was, generally, a dull red. From the bottom of the pharynx, to between three and four inches down the œsophagus, the entire surface of the canal was in a state of ulceration, which appeared to have wholly removed the mucous membrane: it was evidently of malignant character. A few small-defined tubercles, having their own membranous cysts, and consisting of a soft material, resembling stationers' paste, were observed scattered on the ulcerated surface; but this structural characteristic was most evident at the slightly elevated edges of the ulcerated surface, where the mucous membrane yet remained, and in the immediately adjoining cellular membrane; but more particularly in that between the œsophagus and trachea. In this latter situation there was a tubercle, in size and figure resembling a large horse-bean, the centre of which appeared to be of some considerable standing; whilst the more recent circumference was formed by closely-placed small tubercles of a soft consistence, some of which were translucent, and others opaque. The cellular structure surrounding both tubes, and extending as low as the ramification of the bronchi, was remarkably indurated, of a mottled grey colour, and contained numerous small malignant tubercles. This condition extended along the right bronchus, and appeared to be continuous with the indurated and tuberculous portion of the right lung already described. The bronchial glands were rather indurated. The pericardium was healthy. The heart was remarkably flaccid, and its muscular structure rather pale.

There was no appearance of peritoneal disease, old or recent. The

mucous membrane of the stomach was tolerably healthy; but it was slightly injected, and somewhat granular. The rugæ were remarkably large and prominent. The interstices between them were marked by smaller rugæ, inclosing irregular polygonal spaces, in size and figure resembling those seen in the stomach of the ox, though not so sharply defined. The remaining portion of the alimentary canal appeared to be healthy, but much attenuated. There were scybalæ in the colon. The figure of the liver was rather irregular, appearing to have been modified by neighbouring parts. There was a little irregular and partial opacity of its tunic, but its substance appeared remarkably healthy. The gall-bladder also appeared to be healthy, and contained no calculi. The spleen was remarkably small: it had a dense and thick semi-cartilaginous patch upon its surface. The pancreas was healthy. The kidneys presented the granular mottling described by Dr. Bright; but these granules, though they gave an uneven surface to the kidneys, were more than usually translucent. The bladder, which appeared to be healthy, was rather distended.

I do not remember ever to have seen œdema of this membrane existing to any thing like the extent to which it occurs in the larynx. The rings of the trachea sometimes become ossified, or rather are the seat of an earthy deposit; to which change the term 'petrification' has, with more propriety, been applied. The bronchial tubes sometimes become cartilaginous, or even bony, beyond the part at which cartilaginous rings naturally exist. Such transformation, which takes place in the subjacent structures rather than in the mucous membrane itself, is most frequent in conjunction with the hypertrophy or dilatation of these tubes; but it sometimes exists, for a small extent, without these changes.

There are few morbid affections of the trachea and bronchi resulting from external violence, or the agency of foreign bodies. The former, like the larynx, may be divided by wounds inflicted, either medically, for the prevention of suffocation, or for fatal purposes, by the patient himself, or by others. The part itself offers no insuperable obstacle to recovery; but these wounds often prove fatal, by the loss of blood, or by the disturbance of function.

Injuries &c.
of the tra-
chea and
bronchi.

which accompanies them. They may heal either by the closure of the wound, and the restoration of the integrity of the tube, which is the more usual mode; or the orifice may become permanent, and afford a new and accidental communication between the internal and external tegumentary membrane. A horse has been known to live and work who breathed by an opening of this kind. Foreign bodies may, by accident, find their way into this tube; and, if they do not by their bulk or irritation prove speedily fatal, by stopping respiration, their continued presence will generally occasion abrasion or ulceration, with constitutional irritation, wasting, and other symptoms simulating those of phthisis, and often leading to the same termination, unless the offending cause be removed. Pieces of money, fish-bones, the stones of fruit, and the like, have, in this way, occasioned the formation of matter, and an accompanying train of the most serious symptoms. Highly irritating or acrid fluids, such as scalding water and concentrated acids, may also produce fatal morbid conditions of these parts; but their characters need not be particularly described, as they would obviously very much resemble the effects of inflammation produced by other causes.

Introduction
of foreign
bodies.

Into the divisions of the bronchial tubes foreign bodies rarely penetrate; and those which do so, must necessarily be of small size. If not expelled by coughing, they produce cough of longer continuance, accompanied by expectoration; but these may subside, and the foreign body be retained without inconvenience. This, at least, is the statement of Laennec, and I am not disposed to call it in question; but I do not remember to have found any foreign body introduced into and lodged in the bronchial tubes. I have, however, known blood escaping from a wounded vessel in the throat make its way into the subdivisions of the bronchial tubes, and become moulded to their form.

LECTURE XV.

ON THE MUCOUS MEMBRANES.

THE TERMINATIONS OF THE BRONCHIAL TUBES OR
PULMONARY TISSUE.

THE THIRD PORTION OF THE RESPIRATORY MUCOUS MEMBRANE OR LINING OF THE AIR-CELLS—ANATOMICAL CHARACTER OF THE SUBSTANCE OF THE LUNGS—IS THIS MEMBRANE MUCOUS OR SEROUS?—PERHAPS MODIFIED CELLULAR MEMBRANE.—ABNORMAL CONDITIONS—DEFICIENCY—IRREGULARITIES OF ARRANGEMENT—DILATATION OF AIR-CELLS—IS AN ATROPHY, RATHER THAN HYPERTROPHY—CONDITIONS OF LUNG ATTENDING THIS FORM OF EMPHYSEMA—CAUSES OF THE ACCOMPANYING DYSPŒA—SYMPTOMS—HEART DISEASE INDUCED BY IT—LIABILITY TO PNEUMONIA AND PLEURITIS DIMINISHED—BROKEN-WINDED HORSES—BRACY CLARK—INFLAMMATION OF THE LUNG—SEAT OF THE AFFECTION—PROOFS THAT THE PRODUCT OF INFLAMMATION IS SEATED IN THE AIR-CELLS—RECEIVED OPINIONS ON PNEUMONIA—STATE OF ENGORGEMENT—RED HEPATIZATION OR SPLENIZATION—GREY HEPATIZATION, OR GREY SOFTENING—COMPARATIVE LIABILITY OF PARTICULAR PARTS—LOBULAR PNEUMONIA—OBJECTION TO THE RECEIVED OPINION AS TO THE FORMS OF PNEUMONIA—PLASTIC AND NON-PLASTIC FORMS OF INFLAMMATION—CHARACTERS OF PNEUMONIA OF THE PLASTIC FORM—THIS FORM SEEN IN THE LOBULAR PNEUMONIAS OF CHILDREN—A PECULIAR FORM OF IT—TERMINATION IN CONTRACTION &c.—BLACKENED SUBSTANCE OF THE LUNG NOT TO BE CONFOUNDED WITH MELANOSIS—CHARACTERS OF PNEUMONIA OF THE NON-PLASTIC FORM—MODE OF EXAMINING THE AFFECTED TEXTURE—PARTS LIABLE TO THE AFFECTION, AND THE MODE OF ITS LIMITATION—FATAL RESULT OF EXTREME CASES—CAVITIES PROBABLY PRODUCED IN THOSE WHICH ARE LESS EXTENSIVE—CONSEQUENT PUCKERING OF THE SURFACE OF THE LUNG—CHARACTER OF THE RESULTING CAVITY WHEN NOT CLOSED—INTERMEDIATE FORM—SYMPTOMS DETECTED BY AUSCULTATION, PERCUSSION, &c.—CREPITANT RATTLE—DULL SOUND—APPEARANCE OF SPUTA—ANATOMICAL CHARACTERS OF INTERMEDIATE FORM—EFFECT OF ABLUTION—GREY SOFTENING—PRIMARY AND SECONDARY LIGHT HEPATIZATION TO BE DISTINGUISHED—REMARK ON THE DISTENSION OF THE LUNG IN PNEUMONIA—FURTHER PROGRESS OF STETHOSCOPIC SYMPTOMS—CONSECUTIVE ŒDEMA—OBSERVATION RESPECTING CHANGE TAKING PLACE IN SPECIMENS—GREY INDURATION—VARIETIES IN THE APPEARANCES—PORTIONS OF CONSOLIDATED LUNG OF A LIGHT COLOUR—DIFFERENT EXPLANATIONS OF THE APPEARANCE—ABSCESS IN THE LUNG—SUSPECTED FROM THE APPEARANCE OF THE SPUTA—APPEARANCES CONFOUNDED WITH ABSCESS—PUS IN THE BRONCHIAL TUBES—ARTIFICIAL APPEARANCE PRODUCED BY LACERATION WITH THE FINGERS—TUBERCULOUS CAVITIES—EMPHYEMA—SPURIOUS EMPHYEMA—DILATED BRONCHIAL TUBES—BONA-FIDE ABSCESS OF LUNG—PNEUMONIA OF THE MORIBUND—

REMARK OF ANDRAL RESPECTING LACERABILITY — PECULIAR ALTERATION OF THE LUNG ACCOMPANYING HYPERTROPHY OF THE HEART — QUESTION AS TO THE PLEURA ESCAPING INFLAMMATION IN PNEUMONIA — PLEUROPNEUMONY SUPPOSED TO BE A FAVOURABLE COMBINATION — IMPRESSION OF THE RIBS — PUCKERING OF LUNG AFTER INFLAMMATION CAUSED BY CONTRACTION OF LUNG, OF FALSE MEMBRANE, AND OF INTERLOBULAR CELLULAR MEMBRANE — GANGRENE OF LUNG — VARIETIES — GANGRENE OF LUNG IN THE INSANE — STATE OF PLEURA IN GANGRENE OF LUNG — APOPLEXY OF LUNG — HÆMOPTYSIS SELDOM FROM A VISIBLE OPENING — OBJECTION TO THE TERM 'APOPLEXY' — FIRST FORM OF THE AFFECTION — SECOND FORM — UNFAVOURABLE TENDENCY OF PULMONARY HÆMORRHAGE — CADAVERIC ENGORGEMENT — ITS CHARACTERS — IT IS NOT STRICTLY CADAVERIC — RATIONALE OF ITS PRODUCTION — OEDEMA OF THE LUNG — SEAT OF THE AFFECTION — ITS CHARACTERS — CIRCUMSTANCES IN WHICH IT OCCURS — CONFOUNDED WITH HYDROTHORAX — INFLAMMATORY OEDEMA OF THE LUNG.

GENTLEMEN,

YOU will remember, that, in commencing the consideration of particular mucous membranes, I selected, for our first inquiries, the respiratory portion of the gastro-pulmonary mucous membrane; and that, for the sake of convenience, I made three subdivisions of this tissue, two of which have been already discussed. The third portion, to which I now solicit your attention, belongs to those minute cavities or cells by which the inspired air is received, when it penetrates most profoundly into the substance of the lungs. It must be self-evident, that this constitutes the most essential part of the organs of respiration. In it, the inspired air, broken up into minute portions, is brought into its closest connection with the blood which it is destined to purify. Were any proof wanting, that in the higher animals the most important part of the function of respiration is performed in this structure, I might appeal to the facts with which comparative anatomy presents us. These clearly shew, that in proportion as the function of respiration becomes more active and important, the structure of this part of the organs becomes more minute and intricate. Thus, in all the reptiles the air-cells are large and coarse; whilst even in the largest of the mammalia they are as minute and delicate as in the lungs of man; but

Third portion of the respiratory mucous membrane; viz. the lining of the air-cells.

they are most minute in birds, in whom the function of respiration arrives at its highest degree of activity. Hence arises an obvious reason why the derangements which have their seat in this structure are amongst those which exert the most important influence on our health and life.

It is equally obvious, that to obtain an exact knowledge of the many alterations to which this structure is liable, a knowledge of its conformation in the healthy state is an essential preliminary. From the minuteness of this structure in man and the higher animals, its anatomical characters in them are not very easily investigated; and there consequently appears to exist a considerable diversity in the opinions of those who have directed their attention to this subject. Without entering into an analysis of the opinions of those who have most carefully investigated this subject, as, for example, Helvetius, Reisseissen, and Home, I shall limit myself to the description of the structure of the lung, such as I apprehend it to be. You will then be prepared to understand the explanations which I shall offer of some of the morbid appearances met with in this tissue.

The bronchial tubes (with the consideration of which I concluded my last Lecture) may be traced, dividing and subdividing, until we find them of almost capillary smallness. This, as well as some other points connected with the structure of which I am speaking, may be well shewn, by a method for which I am indebted to my excellent friend, (*the late*) Dr. Babington. A collapsed portion of a healthy lung should be taken, having as small an incised surface as possible; and, on this account, one of the lobes of the lung of an inferior animal answers remarkably well. This portion of lung should then be injected, from the bronchial tube, with the white of egg, in sufficient quantity to distend it, and render its pleural surface smooth. The bronchial tube, and the incised surface, are then to be secured by ligature; and the whole boiled for a sufficient length of

Anatomical
character of
the sub-
stance of
the lungs

time firmly to coagulate the albumen. By the same process, the cellular membrane is so much softened as greatly to facilitate the separation of the structure of the lung without injuring the albumen, which has taken the impression of the cavities into which it was injected. In this way we may discover that nearly all the bronchial ramifications lose their fine tubular form, when they have arrived at a particular degree of minute subdivision ; and that, beyond this point, the injected albumen is infiltrated through a spongy texture, so minute, that not only its precise form cannot be made out, but its white colour is lost and converted into a grey, from its intermixture with the structure forming the minute cavities in which it is situated. If the boiling has been continued for a sufficient length of time, the small quantity of cellular structure situated between the lobules is sufficiently softened to allow of the different injected and distended lobules being readily and more or less completely separated from each other. These lobules are closely united one to another by cellular tissue. It would seem, then, to be indicated, by this as well as by some other modes of examination, that the ultimate and essential part of the pulmonary tissue consists of very delicate ramifications of the bronchi ; each of which is surrounded by a circumscribed but small portion of a minutely spongy or cellular texture, in which the last branches of the bronchial ramifications terminate abruptly, by open mouths. I am quite inclined to believe that the minute cells of each individual lobule really communicate with each other ; although wholly without communication with those of the neighbouring lobules, except through the medium of their bronchial tubes. In this opinion, to which I have been led by my own examination, in opposition to some previous prejudices which I had entertained, I have the satisfaction of steering a middle course ; between Helvetius, who thought that there was a free communication between the air-cells of the lungs and the surrounding cellular structure, and Reisseissen, who

holds the opinion that the last minute ramifications of the bronchi terminate in *culs-de-sac*. Some of the morbid appearances, which I shall have hereafter to describe, appear to me to support the view which I have given. I am not prepared to assert that two or more bronchial branches may not supply a single common lobule; nor to say how far the description which I have drawn from the examination of the more superficial part of the lung may require alteration, before it can strictly apply to the more deeply seated and central parts of the lung. Besides the question respecting the anatomical arrangement of the pulmonary tissue, another question has been raised, which is rather more of a verbal character; namely, whether this spongy tissue is to be regarded as possessing a mucous membrane; or, whether it should be considered as more allied to the cellular tissue or serous membranes. The question is one of no great practical importance; but you will infer, from the mode and order in which I have taken up the investigation of it, that I regard it as belonging to the mucous membranes. It will be proper that I should explain myself in this respect, before I proceed with the description of its pathological states. I am induced to regard the surface with which the air comes in contact, even in the extreme portions of the pulmonary tissue, as essentially belonging to the class of mucous membranes, from the circumstance of its unbroken continuity with the mucous membrane of the bronchial tubes, as well as from the simple fact, that it is in direct and uninterrupted communication with the external air. It does, however, present some peculiarities, which essentially distinguish it from other portions of the mucous membrane of the air-passages. From its extreme tenuity, it wants the pulpy, villous surface, and those follicular and other appendages which belong to mucous membranes in their more developed state: its secretion is probably thin and watery from the same cause. The transition from the perfect mucous membrane, as seen in the trachea, to the membrane of the

Is the membrane lining the air-cells mucous or serous?

pulmonary tissue, is quite analogous to that which we meet with in some other branches of the gastro-pulmonary mucous system. The conjunctiva, where it passes over the transparent cornea, does not offer a less striking difference. In the internal ear, the membrane lining the tympanum and covering the ossicula auditus is evidently continuous with that of the Eustachian tube; and is, therefore, another instance of a similar transition: and yet, I believe that no one is disposed to dispute the tympanum being lined by a mucous membrane. In the fimbriated extremities of the Fallopian tubes we have another instance of the transition from a mucous membrane to one of a different class.

Air-cells
perhaps modified cellular membrane.

The minute spongy tissue in which the ultimate divisions of the bronchial tubes terminate, although unconnected with the cellular structure which circumscribes it and forms septa between the lobules, must nevertheless be itself regarded as, in some respects, a modification of cellular membrane. Though presenting a surface obviously continuous with that of the mucous membrane of the bronchial tubes, some of the characters of a mucous membrane are, as I have stated, necessarily lost in the extreme tenuity which the functions to which it is subservient require that it should possess. It would have been incompatible with these functions, for the membrane lining the air-cells to possess that thickness, and the same loose cellular structure on their attached surfaces, which characterize the most perfect specimens of a mucous membrane. It would have been equally incompatible with their functions, for them to produce that viscid mucous secretion which characterizes the membranes alluded to, and to the production of which their thicker texture is an essential condition. The idea, that, in the lobules of the lungs, the bronchial tubes lose their mucous character and terminate in a cellular structure, finds some support in the analogies with which comparative anatomy presents us. We know that in birds the inspired air is not merely received into the lungs, but finds its way into large cavities which pervade

the cellular membrane in different parts of the body. In reptiles, whose pulmonary structure is formed on so large a scale that its anatomical character can be readily demonstrated, the transition from the mucous to the serous or cellular character of the internal surfaces of the air-passages may be made tolerably evident. At the same time, it is indisputable, that this cellular structure is modified for the function to which it is devoted. In fact, there can be but little doubt that its constant exposure to the access of air is of itself competent to produce such an effect.

After this brief sketch of what I conceive to be the true structure of the lung, I now proceed to speak of some of the derangements which this structure, or rather compound structure, may undergo. I am not aware of any natural deficiency of which this portion of the respiratory organs may be the subject; except, that the lungs are wanting in some monsters; and, that some individuals who are possessed of a small chest, as the result of original conformation, are probably furnished with a proportionably small quantity of lung. The obliteration of a part of this structure, as the result of disease, is a far more frequent occurrence; but will be spoken of hereafter, in conjunction with the diseases which give rise to it. There may, however, be irregularity as to the parts composing the lungs. Thus Meckel mentions a total absence of the division into lobes, or a very imperfect degree of separation. There may, also, be excess in the number of lobes. This deviation from the normal state may concur with the existence of a third bronchus. Meckel remarks, that all the cases of this kind which have come to his knowledge, either from personal observation or the statements of others, have occurred on the right side, producing a resemblance to the natural conformation of the ruminants and cetacea.

Abnormal
conditions.

Deficiency.

Irregulari-
ties of ar-
rangement.

The dilatation of the cellular structure is a frequent acquired deviation from the healthy state of the lung; and, as it may be justly believed to constitute a specific affection

Dilatation of
air-cells.

of these organs, is the first to which I shall call your attention. It is an exceedingly common affection, and is met with in every variety of extent and degree; yet it does not appear that any other than extreme cases had attracted the attention of pathologists, until Laennec gave a particular account, both of the morbid appearance, and of the symptoms which attend it. In the least marked cases of this derangement of the lungs, a greater or less portion of one or both of these organs is found remarkably full of air, light, and crepitant. By the inattentive or inexperienced observer, this might very easily be mistaken for the perfectly healthy condition of the organ; though, on closer inspection, it would be seen that the air-cells are larger than is natural—that the membrane forming their parietes is thin and transparent—that the edges of the lung, at the affected part, are swollen and blunted—and that there is a remarkably small quantity of blood in the dilated structure, notwithstanding that death may have taken place under circumstances the most calculated to give rise to sanguineous congestion in the lungs. In other cases, the dilatation is more considerable; and the affected part of the lung bears a close resemblance, in the size of its cells, to those of reptiles. This state is often conjoined with the formation of one or more vesicles of air, which appear to owe their origin to the unequal distension of a cell or cells; and are generally met with near the edges of the lobes, though by no means confined to this situation. It has been supposed that these vesicles are occasioned, not merely by the dilatation, but, in part, by the rupture of the natural cells. I think, however, that this idea must be rejected, or limited to a rupture within a particular lobule; since their presence is rarely accompanied by an emphysematous state of the cellular structure between the lobules. In the most advanced and strongly-marked cases, we find the air-cells of a large size; with numerous instances of particular dilatations, forming cavities of considerable capacity, and situated in various

parts of the lung. If we open some of the most dilated cells, which form rounded projections on the surface of the lungs, we may convince ourselves of their nature, by perceiving the small opening through which they communicate, either directly with a bronchial tube, or with adjoining cells. They are not merely portions of air which have escaped beneath the pleura; since it is impossible to make them change their places beneath that membrane. Emphysema of the lung, produced by the dilatation of the air-cells, in the form which I have now described, and occasioning an apparent increase in the entire volume of the organ, might, at first, be regarded as an example of hypertrophy, and has, in fact, been described as such by a distinguished pathologist. It may, however, be much more correctly considered as an instance of atrophy; since the total weight of the lung is evidently reduced, and the vascularity of its texture, and the absolute extent of surface exposed to the inspired air, are diminished.

Dilatation of the air-cells is an atrophy, rather than hypertrophy.

Such are the principal anatomical characters of this form of emphysema of the lung, dependent on dilatation of the air-cells. There are some other points connected with it, which merit attention. The tissue of a lung in this state is far more dry than is usual, and, as I have before remarked, is very seldom the seat of either serous or sanguineous engorgement, whatever may have been the circumstances under which death has taken place. This is a fact which it may be of importance to keep in mind, on occasions of inspection made for judicial purposes. It does sometimes, though very rarely, happen, that a lung affected with dilatation of the cells is in some degree the seat of effusion; but such an occurrence is, perhaps, only to be met with where inflammation has attacked a lung in this state. The very light colour, as well as weight, of emphysematous lungs appears to indicate that the vessels of the membrane forming the air-cells are either wholly obliterated, or very much reduced in size: hence the permanent dyspnoea.

Conditions of lung attendant on this form of emphysema.

Causes of the attendant dyspnoea.

which accompanies this affection is not merely dependent on the diminished surface presented to the air, but also on the diminished vascularity, and consequent inefficiency, of the surface which remains. On this inferior vascularity of the emphysematous lung probably depends its comparative exemption from black, pulmonary matter.

Symptoms
of emphy-
sema.

The characters which mark this affection during life are chronic dyspnœa, accompanied, in many cases, with but little cough or expectoration, and a high degree of resonance on percussion, in conjunction with a respiratory murmur, which is but feebly audible, except in some advanced cases, where there is a mucous rattle, which excites the idea of its being produced by large bubbles. It has been stated, that when one lung alone is greatly affected by this derangement, the corresponding side of the chest is dilated; but this remark is rather questionable, or the coincidence may be purely accidental.

Heart-
disease
induced by
emphysema.

Emphysema of the lungs appears to have a strong tendency to lead to diseases of the heart, but more especially to affections of the right cavities. I have been induced to notice this fact, by having found several of the best-marked cases of dilatation, and thickening of the right ventricle, in conjunction with this state of lung. A similar remark has been made by Laennec, whose opinion is supported by many of the cases which he has brought forward. It is to this affection of the heart, not less than to the difficulty of respiration, that we are to attribute the anasarca and other dropsical effusions which are sometimes seen in those who die with great and general dilatation of the air-cells. Although emphysema of the lung appears to induce disease of the heart, I am inclined to believe, from the observations which I have made, that it is opposed to the inflammation, both of the lungs themselves, and of the pleura which invests them. I do not know that I can call to mind a single case of acute pleuritis about a lung in this state. Even partial

Liability to
pneumonia
and pleuritis
diminished.

old adhesions are rare, and may have been produced antecedently to the dilatation of the cells*.

Various causes have been assigned as tending to produce this affection. The first, is a diminution of the secretion from the air-cavities, constituting what Laennec has called *catarrh sec.* The next, a viscid state of the mucus lining the bronchial tubes, by which it is rendered difficult for the air to be expelled from the cells. A similar effect is, at times, produced by tumors within the chest; such as, aneurism of the arch of the aorta or arteria innominata, fungoid or scrophulous tumors under the sternum, and long-continued urgent coughs. It would appear, in some cases, to be an hereditary, if not a congenital affection. I can call to mind two or three cases, at least, in which patients who had laboured under protracted dyspnœa for many years, and whose affection was proved, after death, to be emphysema of the lungs, were the children of parents, one or other of whom had laboured under disturbance of the viscera of the chest. The dilatation of the air-cells in horses appears to be in a great degree dependent on a predisposition, which is probably hereditary. It constitutes the essence of the affection known by the name of 'broken wind'; and was described by my friend Bracy Clark, long before the corresponding affection in man was noticed by Laennec. There are one or two other forms of emphysema of the lungs, which may be spoken of more appropriately, at a future time.

Broken-winded horses—
Bracy Clark.

The effects of inflammation on the pulmonary tissue next demand our attention. Inflammation of this tissue constitutes the various forms of pneumonia or peripneumony: and, not only as one of the most common, most serious, and most acute affections to which we are liable, but also

Inflammation of the lung.

* I had noticed this tendency of emphysema of the lung long before I was aware that Louis had come to the same conclusion. It is always satisfactory to have the concurrence of such an observer.

on account of the various and uncertain opinions which have been entertained respecting its precise seat and stages, its morbid anatomy claims our particular consideration.

Precise
seat of the
affection.

By speaking of the inflammation of the substance or parenchyma of the lung, as distinct from bronchitis, or the inflammation of the mucous membrane, and from pleuritis, or that of the serous membrane of the lungs, an idea was often conveyed, that, in this affection, the inflammation, and the changes to which it gives rise, are situated beneath the surface with which the inspired air comes into contact; although it was notorious that the secretion from this surface was most materially altered in character, being, at times, adherent, firm, and tremulous, like size; and at others, deeply tinged with blood. My own observations had convinced me that the appearances dependent on some forms of pneumonia* had their seat on the internal surface of the cells, and were, consequently, connected with bronchitis; but I confess, that, with respect to the majority of cases, or those to which the term 'pneumonia' is more particularly applicable, I adopted and maintained the opinion to which I have just alluded, until my faith in it was completely shaken, by the remarks of my friend Dr. Addison. By his arguments, I was convinced of its being highly probable that all forms of pneumonia have their seat in the same structure; viz. on the internal surface of the air-cells; and are, consequently, the affections of a membrane continuous with that which lines the bronchial tubes. I did not, however, at once abandon the old opinion, without giving it some chance of maintaining itself on the ground of observation. With the assistance of my friend Joseph Lister, I examined, with his powerful microscope, portions of lung affected with different forms of pneumonia. We could detect no difference, as to the seat of the effused

* I allude to those appearances described in this Lecture, as resulting from the least plastic form of inflammation.

product of inflammation, between those cases in which it was evidently deposited in the air-cells, and those in which that condition of the lungs, almost resembling liver, had been produced, and which, consequently, appeared to be the best calculated to afford support to the preconceived notion.

You doubtless have heard, from Dr. Addison, some of the arguments which he has drawn from the symptoms observable during life, under various affections of the lung, in support of the opinion which I think he has the merit of establishing. A very similar train of argument has been adduced by Professor Andral; who, though led by them, to similar conclusions with Dr. Addison, appears to consider them rather as probable than as proved, and does not wholly reject the opposite opinion. Amongst the arguments afforded by symptoms observed during life, may be mentioned the fact, that the rattle which characterizes pneumonia, like every other rattle produced in the texture of the lung, is occasioned by the motion of air in the air-passages, intermixed with their altered secretions. It must, therefore, have its seat within the air-cells, and not in their parietes. The changes which the sputa undergo in pneumonia are further indications that the disease exerts its influence on the internal surface of the cells; and from the constant occurrence of this effect, we may regard them as an essential part of the affection, and not as an accidental concomitant. The notorious fact, that the resolution of the complaint is marked by a change in the matter of expectoration, militates strongly in favour of the opinion which I am advocating: since, if pneumonia had its seat essentially in a substance placed between the cells, how could this be unloaded through the air-passages without the destructive rupture of the cells? whereas we know that the effect is a salutary one. I shall hereafter have occasion to notice an affection of the pulmonary tissue termed 'pulmonary apoplexy,' in which an effusion of blood manifestly takes place into the cells; since from them it makes

Proofs that the product of inflammation is seated in the air-cells.

its way into the air-tubes, and is discharged from the mouth. Now, during life, the portion of lung thus affected affords the same crepitant rattle which is observed in pneumonia; and after death, although it exhibits certain peculiarities, we find an induration which has many features in common with some forms of pneumonia. Let us now examine another affection of the lung, which, like the preceding, has the effect of completely engorging the pulmonary tissue; I mean, the œdema of the lung. Misled by the term, we might readily be induced to suppose that the effusion in this case is situated in a cellular structure placed between proper air-cells, rather than within the air-cells, and, consequently, in strict language, external to the body. Yet in this case, as in the two preceding, we have crepitant rattle; and, in general, the more or less copious expectoration of the same material as that with which the pulmonary structure is engorged; while after death, from its greater degree of fluidity, it may be expressed through the bronchial tubes, which is often impossible with the matter effused in the former cases.

The morbid appearances produced by inflammation upon the structure of the lung, although numerous, are generally regarded as marking the stages of one and the same affection. This, however, is an opinion in which I am far from concurring; believing that some, at least, depend on essential differences existing at the commencement of the attack; and admitting of a satisfactory explanation, on the same principle which I have already applied to the mucous as well as the serous membranes. I shall commence, however, by stating what is now generally taught, and received, with reference to this subject; and, in imitation of Laennec, Andral, and others, shall describe the inflammation of the substance of the lung under three stages: the first, the simple engorgement; the second, the red hepatization; and the third, the grey hepatization. The term 'hepatization,' as applied to the lungs, is now so

Received
opinions on
pneumonia.

generally understood as indicating the consolidation of their structure, that I suppose it may be employed, according to common usage, without the danger of misapprehension. Yet I perfectly agree with Andral, in the remark, that it is by no means strictly applicable to many of the appearances produced by pneumonia; nor can I greatly prefer the terms 'red softening' and 'grey softening,' 'red hardening' and 'grey hardening,' which he has proposed to substitute for the different varieties of hepatization.

In the engorgement, which is regarded as the first stage, or mildest form of pneumonia, the substance of the lung still retains much of its softness and flaccidity; is not wholly deprived of air; and is, consequently, somewhat crepitant; Its colour is altered from a grey to either a bright or a brownish red. When incised, a frothy, sanguinolent serum flows, on pressure; and the structure which this fluid infiltrates is more lacerable than in health, though not so easily broken down as in the forms which I have next to mention.

Stage of engorgement.

The state of engorgement, probably, does not long persist; either subsiding on the prompt resolution of the complaint, or rapidly passing into that condition which is described as red hepatization, or the red softening of Andral. In this state, the substance of the lung has lost its flaccidity, and feels like a solid body: it contains little or no air, and sinks in water: it presents a deep and dull red colour; and, notwithstanding its apparent solidity, it may, in general, be readily broken down by the fingers. It has, when presenting these conditions, been compared to the spleen, to which organ it bears a far stronger resemblance than to the liver. When cut into slices, they do not collapse, as the natural structure does, when simply pervaded by air or fluid secretions; but they more or less completely retain their form: though, by ablution in water, the deposited matter may sometimes be partially, or wholly, removed. When torn, the substance of the lung in this state presents a minutely

Red hepatization, or splenization.

granular surface. Something of the same kind is also seen on the incised surface; upon which, on slight pressure, a sanguinolent fluid, opaque, and more or less thickened, as if mixed with a puriform material, is often seen to exude, from numerous minute points: this, however, for reasons which I shall hereafter explain, is not invariably the case in portions of lung affected with red hepatization.

Grey hepatization, or grey softening.

The grey hepatization, which is regarded as subsequent to, and more advanced than the preceding, is also characterized by the compact and solid state of the pulmonary structure. The whitish colour of the general mass is interspersed with reddish and blackish points, giving rise to a grey colour, which has not inaptly been compared to some varieties of granite. From almost every part of the incised surface there escapes, on very moderate pressure, a more or less discoloured purulent matter, free from the insufferably offensive odour which characterizes the small circumscribed collections of pus occasionally met with in the substance of the lung. The portion of lung affected with this form of grey hepatization may be broken down with extreme facility; whence the term 'grey softening,' used by Andral.

Laennec, in speaking of the consolidation of the lung from pneumonia, attributes it, in part, to the thickening of the parietes of the cells; but he also speaks of what he terms the *infarctus* of these cavities themselves. Hence, like Andral and Rostan, whose opinion I might also have adduced, he may be regarded as having had a glimpse of the nature of the affection, as it has since been more decidedly described by Dr. Addison.

Comparative liability of particular parts.

Inflammation of the pulmonary structure is more often, than not, confined to one lung. It appears to affect the right in preference to the left, and the lower more frequently than the upper lobes; yet this last remark can hardly be applied to all the forms of pneumonia. Out of 210 cases, 121 were on the right side, 58 were on the left, 25 were affected on

both sides, and of 6 the seat was not ascertained. Although the most frequent and well-marked barrier to the inflammation of the substance of the lung is unquestionably afforded by the fissures between the lobes, yet it sometimes happens that such a barrier is presented by the sépta between the lobules. This constitutes what has been called Lobular pneumonia; and is not confined to the lobules of a particular lobe, but may be scattered through one or both lungs. In such cases, it has been justly remarked, that the diagnosis must be particularly difficult.

Lobular
pneumonia.

I have stated, that some appearances, described as belonging to different stages in the progress of pneumonia, are, in my opinion, to be regarded as distinct *ab initio*, and dependent on different modes of inflammation, rather than consecutive changes of the same affection. I shall now lay before you the view which I am disposed to take of the different appearances exhibited by inflammation of the lung: and whether I succeed in converting you to my own opinion, or not, the course which I am about to adopt will facilitate the description of those appearances which you will find described by authors, and meet with in actual inspection.

Objection to
the received
opinion as to
the forms of
pneumonia.

In treating of the inflammation of the serous membranes, I insisted, as you will recollect, on the necessity of distinguishing two different modes of inflammation: the one plastic, in which the more solid part of the product of inflammation consists of fibrin—forms a continuous concrete substance—is susceptible of organization—and is, therefore, entitled to the distinction of vital: the other, in which the product of inflammation continues to retain a more or less fluid form, in consequence of its solid portion consisting of minute particles which do not cohere amongst themselves, but are held in suspension by the fluid portion, which, though often serous and watery, is not unfrequently slightly viscid. No organization takes place in the product of this form of inflammation, and absorption only imperfectly removes it. It may be regarded as void of vital properties;

Plastic, and
non-plastic
forms of in-
flammation.

and may therefore be styled, Non-plastic, Inorganizable, or Puriform. Into this form the plastic may degenerate; on which account, as well as from the occasional salutary approach to the plastic form of inflammation, when the non-plastic had previously existed, we find a variety of appearances produced by the blending of these two forms. I have reverted, in this brief abstract, to the subject of the serous membranes, in order to make more intelligible the application of the same views to the intricate structure of the lungs. I believe that these organs are also liable to two modes of inflammation—the plastic, and the non-plastic; and that we also find a great variety of appearances referrible to their combination and blending.

Characters
of pneumo-
nia of the
plastic form.

I shall commence by speaking of the plastic form of inflammation. I have already noticed the impediment which the natural secretion of mucus affords to the formation of continuous layers of lymph and organized false membranes: it will, therefore, be no subject of surprise, that we do not find, in the texture of the lung, upon a surface which, at least, is continuous with mucous membrane, and participating in some of its peculiarities, extensive perfect specimens of this form of inflammation. The most complete and unequivocal specimens are met with in the lungs of children, and even infants. The lymph effused in these cases is almost invariably coloured with the colouring matter of the blood. The substance of the lung loses its spongy texture, and becomes perfectly solid: it loses its light-red or greyish colour; and, in general, assumes a dull but deepish red, very much resembling that of a tolerably healthy liver. Thin slices carefully washed in water, although they may lose some of their colouring matter, do not allow of the deposit being washed out, and consequently do not recover their cellular structure; but a certain degree of looseness or mobility of parts, which may sometimes be observed before ablation, but is more likely to be met with after it, sometimes occurs, in consequence of the slight degree of

motion allowed by the small quantity of cellular structure between the lobules. This circumstance cannot always take place; since this cellular structure itself may lose its characters by morbid consolidation, to which it is liable. When this limited motion between the indurated lobules is allowed, the affected portion of lung has somewhat the character of the pancreas. Though it has been observed, in this and other forms of pneumonia, that the pulmonary tissue may be greatly affected without the bronchial tubes leading to it participating in the inflammation — and, *vice versâ*, that bronchitis may be continued into the extreme ramifications without the spongy texture, to which they conduct, being affected—it does sometimes happen, that these two portions of the respiratory system are simultaneously affected. I have been particularly struck with this combination, in a case of the most highly plastic lobular inflammation, occurring in a child, in whom the pneumonia accompanied whooping-cough. The bronchial tubes leading to the affected portions of lung were plugged or lined with a fine plastic effusion, similar to that produced in the trachea in the most strongly-marked cases of croup. I might appeal to this fact, as affording some confirmation of the view which I am advocating with regard to the seat of the consolidating deposit in pneumonia. This form of pneumonia, as I have already said, is best seen in the lungs of children; not, however, so often affecting an entire lung or lobe, as constituting what has been called lobular inflammation, in which one or a few contiguous lobules are affected, and the inflammation is accurately limited by the structure which unites the lobules amongst themselves; the consolidation of one lobule abruptly terminating, and contrasting with the spongy texture next to it. Portions of lung thus indurated may be found dispersed in different parts of both lungs, after whooping-cough, small-pox, and other diseases of children, by which their respiratory organs are apt to be affected. It does not appear that this form of inflammation, in its recent state, materially

This form
seen in the
lobular
pneumonias
of children.

Peculiar form of plastic inflammation observed in the lung of a child.

alters the bulk of the affected lobules; since, on opening a chest in which it exists, the different lobules are not observed to differ in dimension from those which are simply distended with air; and the surface of the lung does not appear uneven, until the healthy surrounding lobules have collapsed. I have already noticed this lobular pneumonia, and the difficulty which it presents in the way of diagnosis. Though the plastic inflammation of the lung is mostly met with in the lobular form, it is not confined to it; since a whole lobe, if not a whole lung, may be so affected. I have seen a considerable portion of the lung of a child converted into an apparently solid fleshy mass, of a lightish-red colour; which, I conceive, could only have been the result of a mode of inflammation allied to that of which I have been speaking. Plastic inflammation of the lung, constituting those cases of red hepatization which possess the greatest firmness, are sometimes met with in adults, both in the lobular form, or more concentrated in one lobe or lung.

Termination in the contraction of the substance of the lung, and the appearances produced.

It may now be inquired, what are the changes which the portion of lung affected with this inflammation undergoes on the subsidence of inflammation. I can scarcely conceive the possibility of absolute resolution taking place, and restoring the spongy texture of the lung. It is more reasonable to suppose, that the lobes or lobules, in which a complete destruction of the cellular structure has taken place, may become contracted and indurated; and the appearances, which it is by no means uncommon to meet with in making inspections, tend strongly to confirm this *à-priori* supposition. We may not unfrequently observe the surface of a lung, instead of being smooth and even, corresponding to the internal surface of the thorax, exhibiting more or less of puckering, or sometimes an appearance which suggests the idea of an abnormal interlobular fissure. Although the corresponding portion of pleura is sometimes found smooth and healthy, it is more common for adhesions more or less strong and extensive to co-exist

with these puckerings of the surface of the lung : in which cases, the contraction of these false membranes may contribute to produce the alteration of form. On cutting into the substance of the lung, to ascertain the state of the interior, on which the superficial appearance depends, we do not always discover either the partially obliterated remains of a tuberculous cavity, or any other indication of the pre-existence of tubercular disease ; but, on the contrary, a portion of lung remarkable for its induration and solidity, and want of cellular character. It is densest at the centre ; whilst its ill-defined circumference passes imperceptibly into the surrounding healthy structure. Where the inflammation has been lobular, and confined to only one, two, or three lobules, it may scarcely produce a perceptible plait in the pleura pulmonalis ; and the indurated spot in the substance of the lung may be so small, as to be overlooked, or mistaken for a tubercle. The colour of the indurated portion resulting from this change is not, in every instance, the same. The plastic lymph, by which the cells have been obliterated, has probably, in most instances, a tendency to assume the form of the white non-fibrous tissue ; into which we have seen that this material is often prone to pass, both on the free and on the attached surfaces of the serous membranes : but, as in the case of the red consolidation of the lung which we are now considering, the plastic lymph is accompanied by the red particles of the blood, the colour of the indurated portion of lung will necessarily be influenced by that which these particles may assume in the course of their transformation. Thus, they may present the various shades of red, brown, and grey ; but this last is by far the most common ; and the incised surface of the indurated portion consequently presents a mottled grey, which admits of a great variety of shades. The colouring matter, on which this grey depends, must not be wholly ascribed to the colouring matter of the blood effused with the plastic lymph : it is doubtless, in part, occasioned by the black pulmonary matter previously

existing in the substance of the lung, which, being now brought together by the contraction of the substance of the lung, occasions the deeper shade of grey, by which the affected portion is often distinguished from the surrounding healthy lung. Such instances may justly be regarded as instances of the grey hepatization succeeding to the red; and consequently agree with the generally-received doctrines which I have already stated to you.

Blackened substance of lung not to be confounded with melanosis.

When a considerable portion of lung has been affected with red hepatization, and the quantity of the colouring matter is very considerable, instead of passing into grey, it may acquire a perfectly black colour; the production of which may be regarded as a further illustration of the remarks which I have already offered respecting the formation of black pigment. I must here again caution you against confounding these blackened portions of lung with specimens of true melanosis. I have known the black colouring matter, in the situation which I am now describing, accompanied by such a condition of the fluids, as to produce an indelible dye, by which my fingers have remained stained for many weeks.

Characters of pneumonia of the non-plastic form.

I shall now describe the opposite form of pneumonia; in which the product of inflammation is the least plastic, and consequently incapable of becoming a permanent tissue in combination with the structure of the organ in which it is deposited. It is this form of pneumonia which gives rise to the grey or light-coloured consolidation of the substance of the lung, which is not produced, as is generally taught, as a later stage of the red induration, but which I am persuaded is of a light colour from the very commencement. I am induced to form this opinion, for the following reasons: 1st, The history of cases which, on inspection, have proved to have been of this form of pneumonia, have been of too short duration to admit of the probability that a transition from red to grey had taken place; since we meet with perfect specimens of the red hepatization when

the patient has survived a considerably longer period than that occupied by attacks of pneumonia which have occasioned the most remarkable consolidation, distension, and whiteness. 2dly, There is an essential difference in the form of portions of lung affected by these two modes of disease. We have seen, that in the most plastic form the bulk of the lung is but little altered; but by this form, on the contrary, the texture of the lung appears to be put, in some instances, to a state of extreme distension; so much so, that the upper lobe, which is the frequent seat of the affection, sometimes encroaches on the inferior, so as almost to occupy one side of the chest. The surface of the pleura is rendered smooth and tense, and the lobules appear of large size. The part of the lung so affected is of a lighter colour than is natural, presenting a soiled white, mottled with black pulmonary matter. On making a section through the affected portion, the incised surface presents nearly the same colour—a dead, soiled white, mottled with black pulmonary matter, with a few scattered spots of a reddish colour, generally small and irregular. These red spots are produced by the section of blood-vessels, or by small portions of lung still containing red blood. This form of grey consolidation sometimes suggests the resemblance to Castile soap, with a small quantity of colouring matter, which is apt to occasion a mottling both of grey and red. Though the incision has the appearance of being made through a solid texture, slight pressure causes a whitish, opaque, cream-like fluid to exude from every part of the incised surface.

In the substance of the lung, as in other textures, the non-plastic form of inflammation is attended with so much softening, as to produce a high degree of lacerability: in consequence of which, the substance of the lung easily breaks down under the fingers; and even in removing the lung from the chest, an irregular cavity may be formed, filled with the broken-down texture of the lung mixed

with the puriform secretion. Such an occurrence is particularly apt to take place when the lung is strongly held by old pleuritic adhesions. The inexperienced inspector, unconscious of the violence which he has affected, may mistake a cavity so formed for an abscess in the lung.

Mode of
examining
the affected
texture.

Parts liable
to the affec-
tion; and the
modes of its
limitation.

Fatal result
of extreme
cases.

If we take a thin slice of lung affected with this form of inflammation, and which has received no mechanical injury in removal, and carefully subject it to ablution, without breaking down the texture of the part, we may so completely remove the product of inflammation, that the natural and healthy character of the lung will be completely restored: it loses its distension, and collapses into its natural size. The slice of lung should not exceed the sixteenth or tenth of an inch in thickness; and it should be washed, either by a gentle stream of water passing upon it, or by immersion in water, aided by gentle pressure, otherwise the texture will be lacerated. From this, as well as from the most plastic form of inflammation, the substance of the lung becomes void of air, and readily sinks in water. This form of inflammation of the lung is generally limited by the interlobular fissures; and though it may happen that the whole of one lung may be invaded, one lobe, which is generally the upper, is found in a more advanced state than the others. It sometimes happens, that the septa between the lobules present an effectual barrier to this form of inflammation, which is then met with in the lobular form: such cases are, however, by no means common, and probably, for the most part, depend on local injury; such as a broken rib, or the like. I believe patients seldom recover from this form of pneumonia, when it occupies a considerable portion of the lung, or has greatly distended even a single lobe. The deposit is evidently incapable of becoming a permanent tissue. It is too viscid, to admit of the idea that it can be propelled by the movements of respiration through the air-passages, and be expectorated: and the texture of the lung, in which it is

situated, is so far impaired, as evinced by its want of injection and extreme lacerability, as to preclude the idea that it is capable of producing any material absorption or modification of the distending secretion. When the affection is not of sufficient extent to destroy life, I believe the substance of the lung breaks down, and produces a cavity, bearing a considerable resemblance to those produced by the softening of masses of tuberculous matter, and liable to be confounded with them, and also with abscess of the lung; to which latter term it may, perhaps, have some pretension. The subsequent contraction of these, as well as of other cavities in the substance of the lung, produces a puckering and irregularity of the surface of the organ. The lung may, however, be closely and universally attached to the parietes, by strong pleuritic adhesions; in which cases, the puckering of the lung will be prevented: but if the extent of the disease be great, and the cavity produced be consequently large, and the patient's life be continued, contraction and distortion of the chest ensue, as in cases of empyema. The interior of the cavity varies in appearance, according to the stage at which it comes under observation. When recent, the internal surface is ragged, and the cavity is traversed by the remains of vessels; but when the excavation has existed for years, the internal surface is smooth, and lined by a kind of adventitious mucous membrane, of greater firmness than that which is found in cavities produced by the softening of tubercles. It seems, in fact, to be the smooth surface of the condensed substance of the lung, in which a more plastic form of inflammation has taken place. Such cavities communicate with the air-tube, by openings caused by the truncated branches of the bronchi. They produce a more or less copious secretion, more or less puriform, and occasionally sanguinolent; the expectoration of which is liable to be influenced by the position of the patient; and sometimes takes place suddenly, and copiously, as in cases

Cavities
probably
produced
when less
extensive.

Consequent
puckering of
the surface
of the lung.

Character of
the resulting
cavity, when
not closed.

of empyema, with communication with the bronchi, though not to the same amount. I have seen two lobes thus excavated, and the cavities united by a passage of communication; pleuritic adhesion having closed the interlobular fissure.

Interme-
diate form.

Having now described the extreme cases of the plastic and non-plastic forms of inflammation of the lung, I have next to speak of the intermediate forms. Of these, which probably form a large majority of the cases of pneumonia, I believe that there exists every possible gradation. The tendency to the intermediate form, which seems to be a natural consequence of the structure of the affected part, appears to be a wise provision of nature to promote, if not the resolution, the more favourable termination of the complaint. The deficiency in plasticity, and consequent inferior tendency of the product of inflammation to adhere to the parts producing it, favours its expectoration, and protects the air-cells from obliteration: and, on the other hand, it does not, like the extreme cases of the least plastic form of inflammation, prove destructive to the vitality of the affected structure: the distension is, likewise, not so great.

Symptoms
detected by
auscultation,
percussion,
&c.

Most of the diagnostic and therapeutical remarks on the subject of pneumonia apply to the intermediate forms now under consideration. Although somewhat foreign to my province, I cannot omit to notice those invaluable and characteristic signs of the existence and progress of the disease which have been made known by the labours of Laennec on the subject of auscultation. They are not only of the utmost practical importance when we are engaged in the treatment of the disease, but they mark the corresponding stages into which it will be desirable to divide the morbid appearances. On the first invasion of the affection, when the breathing begins to be disturbed, and the resulting constitutional derangement is scarcely perceptible, there is little if any perversion to be detected, either by auscultation or percussion. It must, of course,

be very difficult to obtain a knowledge of the state of the lung at this period: yet Andral mentions the occurrence of sudden death under what appeared to be an invasion of severe pneumonia; when, on inspection, it could not be discovered that more than an active determination of blood to the affected organ had taken place.

The appearances produced by very recent pneumonia have, I believe, been invariably described as consisting in a highly injected and what is called engorged state, without any material alteration in the texture of the organ in which the engorgement has taken place, unless it be a somewhat greater softness and lacerability. It is probable, that, as soon as this state has been produced, an increased and altered secretion is poured into those cells and passages into which the inspired air penetrates, and gives occasion to the incipient crepitating rattle which forms so characteristic and diagnostic a mark of the early stage of pneumonia. This peculiar sound, the crepitating rattle, has been compared to the crushing of dried salt. To my ear, it has always conveyed the idea of froth with exceedingly minute bubbles being urged through a narrow aperture. For a while, this symptom becomes more marked, and observable over a larger space: by degrees, the respiration becomes less audible, until it ceases to be heard at the affected spot. The chest at the same part is no longer resonant on percussion, but affords a dull sound, which, in extreme cases, is similar to that produced by striking on the thigh, or some equally solid part. The sputa are remarkably viscid and tenacious; and adhere so strongly to the vessel in which they are contained, that they cannot be poured out; but remain fixed, although the vessel be completely inverted. When the vessel receives a sudden jerk or jar, the expectorated matter is frequently put into a tremulous motion, somewhat similar to that which may be seen in weakly coagulated size; at the same time, it is frequently discoloured with intimately mixed blood, which, changing colour

Crepitant
rattle.

Dull sound.

Appearance
of the sputa.

Anatomical
characters of
intermediate
form.

after its effusion, assumes a reddish brown hue, like that of treacle, or the juice in which prunes have been stewed.

When a patient dies in this stage, the lungs present an appearance which I cannot describe better than in the words of Laennec:—"Externally, the lung appears less livid than in the first stage of inflammation, or simple sanguineous engorgement: internally, it is red; but in some parts the colour is deeper than in others, varying from a tinge of violet to a deep blood-red, and producing a somewhat marbled appearance, in which it is easy to distinguish the blood-vessels and bronchial tubes, as well as those spots that are discoloured by black pulmonary matter. The septa between the lobules are sometimes much more conspicuous than in the healthy lung; and they frequently do not participate in the state of inflammation. If we cut in pieces a lung in this state, very little escapes from the incised surfaces; but a small quantity of sanguinolent serum may be scraped off, with the edge of the scalpel. It is thickened and more turbid than that which escapes from a merely engorged lung; and it is often intermixed with a still thicker, whitish, opaque, puriform matter. If we hold the incised surface to the light, we can no longer distinguish the cellular structure; but the surface is granular, or composed of a number of little corpuscles or granules, of a rounded form, but a little flattened."—Andral makes a similar observation; but says, that the surface becomes smooth, instead of granular, when the inflammation is further advanced, and the structure of the lung is more loaded with the product of inflammation.—Laennec continues:—"This granular texture appears, to me, to be an anatomical character proper to pneumonia, in which, and in pulmonary apoplexy, it is alone met with. This granular appearance becomes most evident, when, having made an incision into a lung, we effect a further separation by tearing. The pulmonary tissue then seems to be composed of a multitude of small rounded grains of nearly equal size,

but presenting the different shades of colour above mentioned. It is impossible not to recognise in these little bodies the air-cells transformed into solid grains by the thickening of their parietes, and the repletion (infarctus) of their cavities."

If we take a small and very thin slice of the substance of the lung in this state, and expose it to the same careful ablution as I have already mentioned in speaking of the least plastic form of pneumonia, we shall find, that although we cannot, as in that case, remove the product of inflammation, and restore the cellular structure nearly, or quite, to its natural character, its intermediate state is, nevertheless, exhibited by the partial removal of the secretion, and the imperfect restoration of the cellular character. If the patient has survived in this state many days, we find the inflamed and consolidated portion of lung presenting, in the place of the deep but dull red or livid colour, various shades of lilac and brown, or even of a mottled or greyish colour, produced by the intermixture of numerous small irregular points of a soiled but lightish colour. When this latter colour is marked and predominant, it constitutes what has been called 'grey hepatization,' or the second stage of pneumonia: and, as the substance of the lung in this state, though solid, and nearly or quite void of air, is lacerable, and easily broken down by the finger, it appears to constitute one of the forms which Andral has called the 'grey softening of the substance of the lung.' Under the terms of 'grey hepatization,' and 'grey softening,' it seems probable that the form of which I am now speaking, and also the extreme cases of non-plastic deposit, have been confounded. I have already given a caution against this confusion, in my remarks on the indications afforded by colour. The substance of the lung, though not nearly so much distended as in extreme cases in which the deposit is wholly non-plastic, is, nevertheless, more so than when the deposit has been of a highly-plastic character.

Effect of
ablution.

Grey soft-
ening.

The primary
and second-
ary light
hepatization
to be distin-
guished.

Remark on
the disten-
sion of the
lung in
pneumonia.

The term 'distension,' as applied to the lungs in these cases, requires some explanation: it is not intended to imply that the structure of the lung is actually dilated beyond that extent to which it is accustomed by the inspired air; but the substance of the lung, being occupied by a secretion which does not admit of escape through the bronchi, it appears distended, when compared with the healthy lung in the state of extreme expiration which generally exists after death. I believe that the case is really different, when one or more lobes of a lung are the seat of the least plastic deposit. I have already stated, that, in these cases, even the upper lobe may be eight or nine inches in length. I cannot suppose but that such dimensions are beyond the limit that extreme inspiration can attain. Such distension has, also, in all the cases which I have seen, taken place at the expense of the other lobes, which have been proportionably collapsed. I do not, however, adduce such distension as affording any argument against the opinion maintained by Laennec, in opposition to Broussais, that an inflamed lung may be so distended as to produce an enlargement of the chest on the affected side.—I shall resume this subject, when I speak of the effects of pleurisy complicating pneumonia.

Further
progress of
stethoscopic
symptoms.

I must now return to the consideration of the progress of the symptoms, and corresponding morbid appearances, of the intermediate and most common form of inflammation of the lung, from which I have been making a digression. After the affected portion of the chest has for some time continued to present absence of respiration, and a dull sound on percussion, if the disease happily subside, the sound of respiration gradually becomes perceptible at one or more points where consolidation had existed: the respiration is, however, feeble, when compared with that of health, and is more or less perverted by crepitant or mucous rattle. The expectoration becomes, in general, more free and copious: it loses its peculiar tenacity and

sizy character; and though still discoloured, becomes what is called well-concocted or digested mucus. It is by no means uncommon for the absence of respiration occasioned by pneumonia to be succeeded, for a considerable time, by a well-marked crepitating rattle; which is attributed to the existence of œdema of the lung;—a state which I shall presently have to describe more particularly. When we consider the altered condition of the lung under this comparatively favourable form of pneumonia, the degree to which healthy respiration and resonance may be recovered is very remarkable and surprising. I have had occasion to make an observation with reference to some specimens of lungs hepatized by this form of pneumonia, which appears to me to throw some light on this change. When portions of lung in this state of hepatization have been reserved as good specimens, either for the purpose of preservation or examination, and have been allowed to remain for a few days either in or out of water, I have been surprised to find that the morbid appearance had diminished both in extent and degree, apparently owing to the softening of the material effused into the cells. There still, however, remains some degree of consolidation, even where the cells again become conspicuous; owing, perhaps, as much to lymph adherent to their surfaces, as to any turgescence of which they are susceptible. A similar softening and removal of feebly coagulated and scarcely coherent lymph, such as we are wont to find on the surfaces of mucous membranes, might, in all probability, take place in the living lung after inflammation has subsided. The consecutive œdema may contribute to promote this result. When an opportunity occurs for examining a lung some time after the subsidence of inflammation, we find different degrees of induration remaining: they all, however, agree, for the most part, in being of a grey colour, which has not been unaptly compared to some species of granite. Where the change is permanent, and the solidity complete, it seems to depend on the complete

Consecutive
œdema.

Observa-
tion respect-
ing change
taking place
in speci-
mens.

Grey indu-
ration.

obliteration of some cells, and also on the thickening and induration of the septa between the lobules.

Varieties in the appearances.

Portions of consolidated lung of a light colour.

Different explanations of the appearance.

There are some varieties in the appearance of an inflamed lung, which require a little addition to the description which I have just given of the most common and intermediate form of pneumonia. It occasionally happens, especially where pneumonia has continued for a considerable time in reduced subjects, and where the sanguineous engorgement is neither very great nor of a deep colour, that we find some portions completely consolidated, and, almost throughout, of a light colour, bearing very close resemblance to the state which I have described as resulting from the least plastic form of pneumonia. It is often strictly limited to particular lobules, but is not unfrequently more irregularly diffused. It is necessarily difficult to arrive at absolute certainty respecting the mode in which changes are effected, when they cannot take place under absolute inspection. The cases before us are an illustration of this remark. I believe, however, that the appearances in question may arise in one of the following modes, each presenting some slight modification in the result. In some cases, it is probable that the pneumonia has not invaded the whole portion of the affected lung, either in the same mode or at the same time: hence, one portion of the diseased lung may present the red hepatization, and approach to the plastic form of inflammation, whilst another portion may equally incline to the non-plastic form. Sometimes this light-coloured induration is more probably the result of a change from hepatization, bearing some shade of red. I have already explained to you, that the colouring matter of the blood is susceptible of such a change. In other cases, and perhaps not the least numerous, the concurrence of light-coloured consolidation with the red, in different parts of the same lung, is to be ascribed to the deposition of tuberculous matter, to which the occurrence of pneumonia often gives the tendency. Such deposition more often takes place in

the form of tubercular infiltration, than that of rounded detached tubercles: but of these hereafter. Most of these derangements, the direct or indirect result of the commonest form of pneumonia, appear to invade in preference the lower and posterior parts of the lung.

Abscess in the lung has been described as one of the consequences of inflammation in that organ; and has been considered, by some, as by no means a rare occurrence. The more careful examination and accurate descriptions which have of late years been employed in pathological anatomy, have induced the best recent pathologists almost to deny the existence of genuine abscess of the lung as one of the direct effects of pneumonia. It may therefore not be amiss for me to notice those circumstances which are liable to be regarded as cases of abscess of the lung, and, consequently, likely to be confounded with the very rare cases in which this may actually take place.

Abscess in
the lung.

The idea of abscess in the lung may, probably, have arisen from preconceived notions and symptoms observed during the life of the patient, and independently of any post-mortem inspection. Thus, when a severe case of pneumonia has occurred, the opinion that continued inflammation of the lung is likely to lead to abscess will induce the unguarded practitioner to suppose that this has actually taken place, when he finds those muco-purulent, slightly sanguinolent and soiled sputa which not unfrequently shew themselves towards the close of the complaint. The appearance of purulent expectoration arising from other causes may likewise lead to a similar belief of the existence of an abscess. I shall briefly describe the states of the lung which may concur with these deceptive indications of abscess, before I describe the rare instances in which it may occur.

Suspected
from the ap-
pearance of
the sputa.

Appearances
confounded
with abscess.

The appearance of puriform expectoration, which towards the close of pneumonia has been regarded, ever since the

time of Hippocrates, as a favourable omen, may be ascribed to the expectoration of the puriform secretion, by which the air-cells and small bronchial tubes are loaded, towards the close of the intermediate form of the disease. When we have an opportunity of examining a lung arrived at this stage, we find that the secretion, which, as I have stated, may be scraped off with the scalpel from the incised surface, has become much more abundant, and of a more decidedly puriform character. Not only the small divisions of the bronchi which are filled with it, and pour it out on the slightest pressure, present an appearance which may be mistaken for the existence of minute abscesses; but, under the same pressure, a nearly similar secretion escapes from minute points of the texture itself. The inflamed and softened substance of the lung easily breaks down; and a cavity thus produced, and containing the secretion above described and the *débris* of the lung, may, as I have before hinted, be mistaken for abscess. I have already mentioned the probability that large excavations, containing more or less puriform matter, may, in some instances, be the result of the breaking down of the lung affected with the least plastic form of inflammation, and then receive the name of abscess in the lung.

Pus in
bronchial
tubes and
cells.

Artificial
appearance
produced by
laceration
with the
fingers.

The morbid appearance which is most frequently described as pulmonary abscess, or vomica, depends on the expectoration of softened tuberculous matter; which very often occasions the formation of cavities of various sizes and shapes, filled with puriform and muco-puriform secretion. Such cavities are not only not the necessary results of pneumonia, but cannot be regarded as genuine abscess. I reserve the descriptive of them until I speak of the tubercles which give rise to them.

Tuberculous
cavities.

The most copious expectorations of a puriform character are unquestionably those which take place when in a case of empyema: a communication is formed between the sac of the pleura and the bronchial tubes. Such expectorations

have doubtless been often regarded, during the life of the patient, as the consequence of the bursting of an abscess of the lung; yet the least experienced inspector would, in all probability, discover the mistake, on examination after death. The case, however, may be very different when the empyema is partial and of small extent, being limited to an interlobular fissure, shut up so as to form a close cavity, by pleuritic adhesions about the edge of the fissure; which pleuritic adhesions, if old and abundant, may both conceal and modify the figure of the lung. An extensive section, in such a case, would exhibit a collection of pus, which might easily be mistaken for a circumscribed abscess in the lung.

Empyema.

Spurious
empyema.

The dilatation of the bronchial ramifications sometimes gives rise to a considerable cavity; which, when filled with muco-purulent secretion, may likewise be mistaken for abscess, especially if there be a portion of the tube leading to the cavity which does not participate in the dilatation. The formation of pus which sometimes takes place in the cellular membrane between the lobules cannot be mistaken for abscess in the lung, since it does not occasion collections of pus.

Dilated
bronchial
tubes.

The rare instances, in which what may be regarded as abscess in the lung really takes place, occur when a portion of lung has been consolidated by inflammation obliterating the air-cells. In such consolidated portions of the lung, suppuration may take place, and produce a collection of pus having the character of abscess. The pus so formed, is neither very pure nor very copious. I do not know that I have seen above a drachm collected in such a cavity; and, in most of the instances which I can call to mind, there was also present gangrene of the lung, which had produced some slough or eschar.

Bonâ-fide
abscess of
lung.

Before I proceed to speak of gangrene as one of the results of inflammation of the lung, I must mention an

Pneumonia
of the mori-
bund.

appearance of the lung closely allied to the effects of inflammation, if not a variety of the same thing, although it may have not been attended with any symptoms of an inflammatory character. It occurs in those who have laid a considerable time in a sinking or moribund state; and has hence been called 'the pneumonia of the dying.' It has been particularly noticed by Andral, who has well described it. It occurs precisely in those situations which are the seat of the sanguineous cadaveric engorgement noticed by Bichat, with a caution against confounding it with pneumonia, that is to say, at the posterior part; the body during the agony, and subsequent to it, being generally placed with this part downwards. It is highly probable that the two states have often been confounded, in post-mortem inspection. The distinction, though interesting in a pathological point of view, is, in fact, of little practical importance; except in those cases of judicial examinations, in which every thing which can throw light on the state of the individual just before and just after death may be of vital interest.

The portion of lung thus affected is of a deep dusky livid colour, heavy, and void of air; and though apparently solid, readily breaking down under the fingers. Though extremely likely to be mistaken for cadaveric engorgement, it may, on close examination, be observed, that the pulmonary structure is rather firmer than mere cadaveric infiltration renders it. It is not merely a dark bloody fluid that flows from the incised surface: it differs rather in consistence than in colour, being slightly thickened and opaque. It is evident that an effusion of coagulable lymph has taken place. The substance of the lung is more lacerable than simple cadaveric engorgement renders it; and, as in the pneumonia which is intermediate to the plastic and non-plastic forms, the careful ablution of a thin slice of the lung imperfectly restores the cellular character. This, and the character of the fluid escaping from the incised

surface, form the most important distinctions between the two states.

The condition of the lung affected with the pneumonia of the moribund appears to bear the same relation to what is called cadaveric infiltration; but which, for the reasons I have already stated, and which the present observation tends to confirm, I believe to commence a very little before death; as the commencement of hepatization, or rather splenization, does to inflammatory engorgement. It would appear, that the accumulation of blood, taking place but a very short time before death, and commencing what is called cadaveric infiltration, becomes the source of a slight degree of irritation, under which an alteration of secretion takes place; although the system is incapable of setting up that degree of re-action on which the constitutional inflammatory symptoms depend.

The softness and lacerability of the texture of the lung, both in this state and in mere cadaveric infiltration, has arrested the attention of Andral; who rejects the idea which he was once disposed to adopt—that this lacerability is the result of an alteration of tissue, occasioned by inflammation; but considers the laceration as dependent on the natural delicacy of the structure, which escapes injury by yielding when air is present, but is torn when the resistance is increased by sanguineous and other effusions. There can, I conceive, be no doubt as to laceration being promoted in the mode pointed out by Andral: nevertheless, I do not wholly reject the influence of inflammation in softening the texture of the lung in the pneumonia of the moribund; but I also believe that an increased lacerability of texture, occurring in the instances before us, as well as in many others, is not always necessarily connected with inflammation. It probably commences before death, but increases afterwards. The mucous membrane of different parts of the alimentary canal affords examples of this form of softening.

Remark of
Andral re-
specting la-
cerability.

There is still another state of the lung, which I believe

Peculiar
alteration of
the lung ac-
companying
hypertrophy
of the heart,
&c.

I cannot better introduce to your notice than at the present time; though I am unable to say, whether it should be regarded as the result of an inflammatory process, or not. The substance of the lung, in the condition to which I am alluding, has not lost its spongy and crepitant texture, but is more firm and resisting than the healthy lung. It does not appear that any particular colour belongs to it, but that it may present any of those colours which may be observed in the lungs of those who have died under ordinary circumstances. Its peculiarity is best appreciated by the touch: it is somewhat more resistant than is natural. Whereas the healthy lung may be compared to a very fine sponge, the portion of lung in the state of which I am now speaking rather suggests the idea of a coarser sponge of harsher substance. I do not mean to imply that the cells are dilated, but that their septa have acquired strength and thickness; and the portion of lung seems a little heavier than is natural, independently of the fluid by which it is pervaded. I believe that all the instances that I have met with, of lungs in this state—for it is a general, rather than a partial condition of the respiratory organ—concurred with disease of the heart; and I conjecture that it is a result of the hypertrophy or inordinate action of that organ.

It is not improbable, that a state of the lung similar to that which I have just been describing may at times be produced, as a sequel to one of the intermediate forms of pneumonia; by which the parietes of the cellules may have been thickened, without obliteration of their cavities.

There is pathological condition of the lung which I believe to be decidedly of an inflammatory character; but which differs so materially from the forms of which I have now been speaking, that I shall reserve further notice of it, until I come to speak of œdema of the lung, of which it may be regarded as a variety.

Although I have pretty fully treated of the inflammation of the pleura, when the serous membranes were under

consideration, I must say a few words respecting the state of this membrane in conjunction with pneumonia. It has been supposed by some, that this membrane cannot escape inflammation, when the organ which it invests is affected: but we have the authority of Laennec, that the pleura may be found to all appearance healthy, covering a decidedly-inflamed lung. I think I have observed the same thing myself. It more often happens that the pleura corresponding to the inflamed portion of lung is also inflamed, and covered with a layer of false membrane, generally of but little thickness, and accompanied with very little fluid effusion. Laennec, however, mentions a case, in which a deposit of this kind, having no greater firmness than that of the coagulated white of an egg, presented a considerable but unequal thickness: and he remarks, the deep impression which the inflamed and consolidated lung received from this comparatively soft body is a proof of the little power that an inflamed lung can have in distending the chest. I have known him frequently express the opinion, that the complication of pleurisy with pneumonia was rather to be regarded as a favourable circumstance, than the reverse; because, he conceived that the pressure of the effusion into the cavity of the pleura tends materially to repress and limit the effusion into the substance of the lung.

Question as to the pleura escaping inflammation in pneumonia.

Pleuro-pneumony supposed to be a favourable combination.

The marks of the ribs which may be sometimes seen on the surface of an inflamed lung were, as I have already observed, denied by Laennec to be really impressions; since, as he observes, the intercostal muscles and tendons support the pleura in the intercostal spaces at the same level with that lining the ribs, except where there is a manifestly distending cause, as in hydro-thorax and empyema. This power, as I have said, he denies to pneumonia: and he contends, that the appearance alluded to is to be attributed to an old pleuritis having occasioned an intimate adherence between the pleura pulmonalis and pleura costalis: both being taken out with the lung, the print of the ribs is

Impression of the ribs.

exhibited, in consequence of the larger quantity of cellular membrane, fat, or lymph on the attached surface of a pleura costalis, where it corresponds with the intercostal spaces, than where it lines the ribs. I do not dispute that the print of the ribs may be sometimes produced in the manner described by Laennec; but it may also be seen on the pleura pulmonalis, when a false membrane applied to it corresponds with the intercostal spaces, but is nearly or quite wanting opposite to the ribs. Where this false membrane is removed, there will be a sensible irregularity on the surface of the lung, indicating the course of the ribs; but the depressions would correspond with the intercostal spaces, and not with the ribs. I am not, however, prepared to say that an inflamed lung is never indented by the pressure of the ribs: on the contrary, I have seen cases in which I have been satisfied that such indentation had taken place.

The puckering of the lung after inflammation caused by contraction of lung, of false membrane, and of interlobular cellular membrane.

I have already noticed the influence which the contraction of a false membrane co-existing with pneumonia exerts in promoting the puckering of the surface of the lung; and I believe I need not make any further remark on that point: but I may observe, that this false membrane, when fixed as a permanent tissue, is liable to become closely united to the septa between the lobules, which, as I shall hereafter have occasion to observe, sometimes become inflamed, in conjunction with the substance of the lung. This union, I conceive, promotes the puckering effect of the contraction of both structures.

GANGRENE OF THE LUNG.

Gangrene of the lung.

Gangrene is sometimes met with, affecting the substance of the lung, as a sequel to pneumonia; but it seems generally, if not always, to require some peculiarity in the constitution of the individual, rather than merely to depend on intense inflammation. Thus it will sometimes take place, with great rapidity, in an acute form, in conjunction with

phlebitis, and in fever; when a variety of circumstances have concurred to produce in a high degree that state which is known by the term 'typhoid.' When it occurs in a more chronic form, it is, I believe, invariably in those persons who are labouring under a marked state of cachexia. I have known it exist where syphilis and mercury had concurred with reduced circumstances, want, and exposure to cold. Although in these chronic cases it is mostly a sequel to an attack of pneumonia, which has left the lung in a state of hepatization, yet I believe it sometimes affects small spots scattered through the substance of the lung; which quickly loose their vitality, without the precurrence of the ordinary symptoms of inflammation of the lung. All these cases of gangrene of the lung are invariably marked by one constant symptom, namely, the horrible fœtor of the breath; which, though sometimes present without gangrene, and merely dependent on the state of the secreted sputa, should generally lead to a suspicion and inquiry as to the existence of gangrene.

Gangrene of the lung has been observed, in the Lunatic Asylum at Ghent, to be of frequent occurrence in the insane; —a fact which tends to confirm the close relation between the brain and lungs, which has been pointed out by Dr. Foville*.

Gangrene
of lung in
the insane.

There are some differences in the forms of gangrene of the lung, of which I have been speaking, which it will be proper that I should now describe to you. When it occurs in an acute form, as the direct effect of an attack of pneumonia, the slough is of more considerable size than in the other forms; its limits are not so well defined; and instead of being detached, it may be loose and flocculent in the centre, and pass insensibly into the living but inflamed lung at the circumference. In the other cases of gangrene of the lung, we meet with one or more, sometimes

Varieties.

* See the Notes on this Chapter, at the end of the volume.

several, well-defined cavities, generally of about the size of a nut or almond, enclosing a detached slough, and a small quantity of much discoloured and very offensive pus. In a lung in which such gangrenous eschars existed, I have sometimes, though very rarely, met some portions of lung, in which, though gangrene had taken place, separation had not commenced. In these cases, a portion of lung, still retaining its original structure, presented a dirty olive colour, the limits of which were well marked; and, at the same time, an offensive putrid odour was exhaled.

Appearance
of the pleura
in conjunc-
tion with
gangrene of
the lung.

A portion of lung is sometimes separated by the softening of tuberculous matter. The death of the part, which must have necessarily taken place, is here rather dependent on a mechanical than a constitutional cause. The death of a portion of lung may, at times, concur with the softening of fungoid and other deposits: it may also be induced by violence to the chest. When a portion of lung is affected with gangrene, and more especially if it be in a circumscribed form, we may generally find its existence indicated by a corresponding spot on the surface of the pleura, being of soiled white or ash colour, which is generally accompanied with a greater or less degree of flaccidity. We shall, also, generally find more or less pleuritic inflammation; which is, in all probability, set up before gangrene has actually taken place, or at least before it has reached the surface of the lung. In such cases, a layer of recent false membrane may be found coherent, translucent, and retaining its plastic organizable character towards its circumference; whilst towards the centre, where opposed to the sphacelated lung and pleura, it also is found sphacelated and opaque.

APOPLEXY OF THE LUNG.

Apoplexy of
the lung.

The pathological state of the lung, to which this term has been given, and to which I have already made allusion when I was engaged with the consideration of the seat of the consolidating deposit in pneumonia, bears, in some

respects, great resemblance to extreme cases of red hepatization. It has, however, so much peculiarity, as to require distinct consideration. Although the symptom to which it gives rise is a very common and a very important one, and, consequently, well known—I mean hæmoptysis—this particular morbid state of the lung appears to have been very much overlooked, until it was described by Laennec.

The cause of this, I believe, is mainly to be attributed to the strong impression of a preconceived and erroneous opinion respecting the source of the hæmorrhage. In common parlance, as well in as out of the medical profession, the rupture of a blood-vessel is spoken of almost as synonymous with hæmoptysis; and a large vessel, or a small vessel, is mentioned as having poured out the blood which has been expectorated. Nevertheless, I firmly believe, that, with the exception of some rare cases, in which the production of a tuberculous or other cavity may have been attended with the division of an open vessel—a case very inconsistent with the ordinary progress of such cavities, since the blood-vessels are seldom divided until they are entirely obliterated by such excavation—and except in the equally rare cases of wounded lung—it is probable that no one has ever been able to detect the orifice, or even the vessel from which the blood has escaped. It appears rather to proceed from the minute and capillary vessels of the part in which constitutional or mechanical causes have induced a preternatural afflux of blood. When it is from these minute vessels that the hæmorrhage in hæmoptysis takes place, I believe that both the minuteness of this vascular structure, and the extravasated blood and coagulum diffused about the seat of hæmorrhage, contribute to render it physically impossible for the open orifices to be discovered.

The term ‘apoplexy’ has not, without reason, been objected to, as used in these cases; since it is a perversion from the meaning originally designed to be conveyed by it; namely, the sudden and knocking down affection of the

Hæmoptysis seldom produced by division of a visible vessel.

Objection to the term ‘apoplexy.’

head, by which motion and sensation, to a greater or less extent, are more or less permanently impaired, and which may proceed from other causes besides hæmorrhage within the cranium; such as, serous effusion, and more particularly softening of the brain. The reason which influenced Laennec (who, in general, paid great attention to the etymology of words) seems to have been, a conviction that these cases, as well as others, in different parts of the body, as, for example, in the liver, the eye, and under the integuments, depend on a local determination of blood to the capillary vessels of the part which constitutes the essential cause of the hæmorrhage.

First form of
the affection.

Apoplexy of the lung occurs under two distinct forms: the one, either constitutional, or dependent on the lung itself: the other, secondary, and resulting from some cause interfering with the pulmonary circulation, which, in most cases, is found to be seated in the heart. In the first form, which may be considered as idiopathic apoplexy of the lung, one or more portions of the pulmonary texture is found gorged, to consolidation, with blood, which has completely filled and obliterated the air-cells. The portions of lung so affected have a rounded figure; which, though not perfectly defined, is, nevertheless, more marked than pneumonic consolidation: they vary in size from one to two or three inches in diameter: and although the surrounding substance of the lung is generally crepitant and healthy, or only a little reddened, it sometimes happens that smaller ecchymosed spots occur near some of the principal extravasations. Pulmonary apoplexy is often not confined to one spot in the lung: there may be several of these consolidated portions dispersed through one or both lungs; but they are generally met with in the posterior and inferior part of the lobes. When cut into, they generally present a deep venous hue: and the surface often appears granular, as in cases of hepatization, and, in all probability, from the same cause;

namely, the distension of the air-cells. Laennec, however, has observed, that in pulmonary apoplexy the granules appear larger than those which are seen in pneumonic consolidation. It is not uncommon, towards the centre of these masses, to find a small collection of extravasated blood, either fluid or coagulated, lodged in an irregular cavity. Such evidence of the laceration of the substance of the lung is, perhaps, as often the effect, as it is the cause of the hæmorrhage. This form of apoplexy of the lung is often accompanied by the most profuse hæmoptysis: ten pints are said to have been voided by one individual in forty-eight hours, when the patient died. In its attack, it is accompanied with quick pulse, hot skin, flushed face, and other symptoms of acute pyrexia. It is not always possible, by percussion, to discover the part of the lung in which consolidation has taken place; which may be, in part, attributed to the form and limited extent of the derangement, and, in part, to the effusion taking place deep in the substance of the lung. In the part actually consolidated, the sound of respiration must be necessarily extinct; but its immediate vicinity is the seat of a very characteristic crepitant rattle.

When, as is not unfrequently the case, patients recover from this form of hæmoptysis, the dull sound, where it existed, and the crepitating rattle, give place to healthy resonance and respiration: and it is stated by Laennec, that when he examined the bodies of those who had died of some other affection after recovery from pulmonic apoplexy, very little trace of the derangement could be detected. He was not able to trace the steps by which the restoration of the lung was effected: but he remarks, that he believes that the deep venous hue is succeeded by brown, and this by a still lighter shade. He adds, that he does not think that pulmonary apoplexy is succeeded by œdema of the lung, as in the case of pneumonia. I do not remember that I have ever had occasion to observe an undoubted

specimen of a lung in which the cure of idiopathic apoplexy had taken place; but I believe, that, like the plastic form of pneumonia, it may produce considerable puckering of the lung, accompanied by more or less discoloration, occasioned by the production of black pigment. Pulmonary apoplexy sometimes exhibits a similar appearance to that which I have just described, as respects the rounded form of the scattered portions of lung in which consolidation has taken place; but the symptoms which attend it are rather of a passive, than of an active nature. It seems to be one of the forms in which purpura hæmorrhagia exhibits itself. In a case of this kind which came under my notice, the consolidated portions were of large size; and there were numerous small ecchymoses scattered through the intervening structure. The hæmorrhagic tendency exhibited itself in various parts of the body, and, in particular, by the production of numerous petechiæ. This individual had had an obstinate spitting of blood, but the quantity was not very profuse: its colour was dark, approaching to brown; and bearing some resemblance to that which occurs in the worst cases of pneumonia.

Second form
of pulmo-
nary apo-
plexy.

In the second form of pulmonary apoplexy, or that which may be regarded as secondary, and dependent on some impediment in the circulation, the consolidated portions are well defined, being strictly limited to particular lobules: hence, it produces an appearance of the lung bearing the closest resemblance to some lobular pneumonias. The appearance of the incised surface is very similar to that exhibited in the preceding form; but I do not remember ever to have seen any visible laceration. I can offer no opinion as to the degree in which the lung may recover its healthy state after this form of apoplexy; but I have had more than one opportunity of observing, that the effused blood undergoes those changes of colour which I have already described. At or near the circumference of the consolidated portion, the deep venous hue gives place to a dark

brown, in which there is a trace of ochre yellow: this change proceeds through the entire mass, which gradually assumes a more decided yellow: this becomes progressively lighter; and after the lapse of some months, the colour of the spot may almost be described as yellowish white. I cannot suppose this to be the uniform progress, when the patient long survives the attack. It is more than probable, that different circumstances, affecting the constitution of the individual, will materially influence the changes which take place in and about the effused blood. Thus it is very probable, that, instead of the colour becoming lighter, it may acquire a darker colour from the production of black pigment; and the lobules, instead of retaining nearly their original size, may be very much contracted, and occasion a puckering of the surrounding lung. I have met with this form of apoplexy of the lung in cases of diseased mitral valve; and this concurrence is recorded in numerous instances, which tend to confirm an opinion which might easily be conceived *à priori*, that the derangement of the mitral valve is particularly prone to occasion hæmoptysis.

There is a very different appearance of the lung which sometimes accompanies profuse hæmoptysis. The greater part of the substance of the lung, so far from being gorged with blood, appears even paler and more exsanguine than is generally the case after death; but a number of small ecchymosed spots, of about the size of pepper-corns, are sprinkled through one or both lungs. I do not know what may be the general result of such cases; but in an instance of this kind, which came under my notice, very profuse hæmoptysis, which accompanied it in the person of a rather debilitated young female, was quickly fatal. Had it terminated otherwise, and the patient recovered, it seems more than probable that inspection at a subsequent period would have been unable to detect any traces of the affection. I conceive it not impossible, that a case of this kind may have induced Laennec to believe in the perfect

A peculiar appearance of the lungs sometimes seen after hæmoptysis.

restoration of a portion of lung indurated by pulmonary apoplexy.

Doubt respecting its nature.

I must not omit to state, that since the peculiar appearance of the lung, which I have just described as connected with hæmoptysis, first arrested my attention, the examination of one or more recent cases, and the observations of my friend A. Twedie, have induced me to feel disposed to unite with him in doubting whether the spotted appearance of the lung has not been the consequence, rather than the cause, of the hæmoptysis; seeing that it may be brought about by the passage of blood down the air-tube into the lungs, rather than in the opposite direction.

Unfavourable tendency of pulmonary hæmorrhage.

Whether the structure of the lung be capable of restoration to perfect integrity, after having been the subject of pulmonary apoplexy, as Laennec has conjectured, or not, there can be no doubt that it does not necessarily lead to such a state of the respiratory organs as is incompatible with life and health. It becomes, therefore, an important question, well worthy of careful attention and investigation, why it is that hæmoptysis is so very frequently the prelude to phthisis. There can be little doubt, but that, in many of these cases, the hæmorrhage is not dependent on pulmonary apoplexy; but rather the effect of the progress of tubercles previously developed in the lung, but which had not occasioned any symptoms which had attracted attention. There is nothing surprising in such cases being quickly followed by the usual symptoms of advancing phthisis, which the progressive softening of tubercles, and the irritation caused by the extravasated blood, cannot fail to promote. In other cases, I believe, the hæmorrhage from the lung takes place without the existence of tubercles; but still may be regarded as an evidence of weakness or delicacy in the respiratory system, extremely favourable to the production of tubercles, if there be any strumous tendency in the constitution. Where this state has not already manifested itself, it is very probable that it is called into action by the reduc-

tion occasioned by the hæmorrhage, and by the irritation of the blood poured into and obstructing the air-cells, and, perhaps, most of all, by the reducing regimen and deleterious agents which, I fear, are often too indiscriminately and unsparingly resorted to. This is a point to which I would solicit your most serious attention. Again, there are other cases in which hæmoptysis lasts for years, and is either the effect of pulmonary apoplexy, or of hæmorrhage from the mucous membrane of the bronchial tubes; and in which, after death, not a trace of tubercles can be detected.

Before I pass from the consideration of those states in which an increased quantity of blood is present in the lungs, I must mention one form which it is necessary to be aware of, and to distinguish as a cadaveric rather than as a morbid appearance;—I mean, that state which is generally known by the name of ‘cadaveric congestion of the lung’; and in which we find those parts of the pulmonary structure which, from the position of the body, have been situated the lowest at the time of death, and subsequently to it, infiltrated with a large quantity of blood and sanguinolent serum, and presenting the firmness and specific gravity of hepatization. Bichat, who paid great attention to the appearances of the lung after different kinds of death, whilst preparing his great work “On Life and Death,” has called particular attention to this state, in order to prevent its confusion with those appearances which are morbid. The colour of the lung in this state is more decidedly venous than in most cases of pneumonia, and the texture is not nearly so firm as in most cases of sanguineous apoplexy: it is somewhat more lacerable than the parts of the lung not affected with it. Deeply sanguinolent serum escapes, with little or no pressure, from the incised surface. The limits of those parts of the lung which are thus affected are well defined, and the parts immediately adjoining them are often perfectly exsanguine. By washing a slice of

Cadaveric
engorge-
ment.

Its charac-
ters.

lung in this state, the natural texture of the lung becomes quickly and completely restored.

It is not
strictly
cadaveric.

Though this state of the lung is generally reputed cadaveric, and for most practical purposes may justly be regarded as such, I am convinced that it must at least have commenced before death. As I conceive that the establishment of this point may be of considerable importance in some cases of a judicial nature in which a medical opinion may be required, I am induced to say a few words in support of this opinion. I can scarcely conceive that so complete a distinction between the superior and lower portion of a lung can be produced by the mere gravity of the fluids, unaided by the agency of the circulatory system. Were this the case, we ought not only to find the infiltration at the lowest part of the lung, but also in the lowest part of each individual lobule, even in those parts which have a superior position. I cannot but conclude, therefore, that the appearance in question commences during the agony, and whilst there yet remains sufficient power to produce some motion of the blood in its vessels, and carry it forward to those parts in which gravitation does not afford resistance. We know, too, that during the agony the arterial system of the greater circulation becomes nearly empty, and that, with the exception of those cases in which a considerable impediment to respiration operated before death, the veins, also, are much emptied, producing the proverbial paleness of death. The production of this state must obviously require something more than the operation of mere gravitation; and the fluid, thus removed from the greater circulation, must be under the influence of a power sufficient to convey it to the lungs, and give it some motion there. There can be no doubt, that, after death has apparently taken place, a degree of action of the heart and vessels may continue for some time: we may be satisfied of this, not only by the fibrinous coagula so often found in the cavity of the heart, but, still more forcibly, by

Rationale of
its produc-
tion.

the inspection of the beating hearts of some of the inferior animals, opened when death had apparently taken place. These considerations may assist us in forming an opinion, whether an individual found dead had really expired, and lain for some time after death, in the position in which the body may have been found. As connected with this subject, I must likewise remind you of the fact which I have already stated; namely, that a general emphysema of the lungs, dependent on dilatation of the air-cells, is very unfavourable to the accumulation of blood in the lungs, either as a morbid or as a cadaveric symptom.

ŒDEMA OF THE LUNG.

Although this affection is one of frequent occurrence, and must therefore often fall under the eyes of morbid anatomists, it appears that, like many other affections, it had very much escaped their notice, until Laennec called the attention of medical men to it. Like cadaveric congestion, it generally occurs at the posterior and most dependent parts, which are consequently much increased in specific gravity. When the œdematous portion of lung is cut into, a considerable quantity of thin serum rapidly escapes: it is frequently mixed with an infinite number of minute bubbles of air: at other times, it is nearly free from them. Œdema of the lung is often conjoined with cadaveric infiltration; when, of course, the escaping serum is highly sanguineous: when this is not the case, the serum is sometimes nearly colourless. There can be no doubt that the air-cells themselves are the seat of the serous effusion, and not the cellular membrane supposed to intervene between the cells. Laennec admitted, and taught, that the air-cells themselves were the seat of the fluid. The truth of this opinion is shewn by the copious watery expectoration which those patients produce who are labouring under this affection; and still more so, by our finding, after death, that it pours profusely through the bronchial tubes, when pressure is applied to the lung.

Œdema of
the lung.

Seat of the
affection.

Its charac-
ters.

The appearance of the pulmonary structure is little altered by œdema: it is rather pale than otherwise, except where it may have received a colour from cadaveric infiltration. The substance of the lung pits under moderate pressure with the finger, but breaks down when more force is applied; partly from the enfeebled state of the texture; and partly, as Andral has observed, in consequence of the increased degree of resistance which the œdematous substance offers to the finger.

Circum-
stances in
which it
occurs.

It does not appear that œdema of the lung is often a condition of long duration. Its existence is indicated, like that of pneumonia, by a crepitating rattle, as well as by the characteristic expectoration before mentioned. By these signs we may be led to detect œdema of the lung as one of the later symptoms of general dropsy; for it appears that the substance of the lung is not prone to this affection, probably in consequence of the energetic power of absorption with which it is endowed; as proved by the experiments of Meyer and Majendie, who produced a sort of artificial œdema of the lung, by injecting water into the bronchi of dogs, and found that it was very speedily removed by absorption. Nevertheless, œdema of the lung sometimes takes place in cachectic subjects, when there is little or no tendency to general dropsy. I have already remarked, that œdema of the lung is sometimes a sequel to pneumonia; when, I believe, its existence, if not immoderate, is favourable to the return of the consolidated lung to its healthy state. Œdema of the lung is sometimes occasioned by bronchitis; in which case it is frequently mistaken for hydrothorax; although the presence of respiration and of some degree of resonance on percussion, and the absence of the dull sound varying with the position of the patient, as well as of œgophony, and of the dilatation of the affected side of the chest, together with the mobility of the ribs, afford, in most cases, ready and ample means of diagnosis. On the other hand, I believe it has been supposed that the sym-

Confounded
with hydro-
thorax.

ptoms of hydro-thorax are aggravated by the effusion eventually taking place in the air-cells. Such a complication may possibly exist; but I believe it to be necessarily rare, as the existence of the pleuritic effusion must be at least as much opposed to œdema of the lung as to pneumonia.

Before I quit the subject of œdema of the lung, I must mention a form of it which I have occasionally met with, but which I believe to be of rare occurrence. It may be regarded as a decidedly inflammatory œdema, being accompanied by acute pyrexial symptoms; and therefore analogous to the œdema which accompanies erysipelas, to some cases of œdema of the larynx, and to the profuse watery scalding discharge from the mucous membrane of the head in gravedo. The substance of the lung when affected with this œdema is gorged with a nearly colourless fluid; the situation of which does not appear to be much influenced by the position of the body. In the best-marked case of this kind which has fallen under my examination, the inflammatory character was further indicated by the general production of pus in the cellular membrane uniting the lobules.

Inflam-
matory œdema
of the lung.

LECTURE XVI.

ON

THE MUCOUS MEMBRANES.

TUBERCULOUS DEPOSITS IN THE LUNGS.

PHTHISIS—LIMITATION OF THE TERM—THE WORD 'TUBERCULOUS' EMPLOYED IN TWO SENSES—SENSE ATTACHED TO IT ON THE PRESENT OCCASION—PRELIMINARY REMARKS ON TUBERCULOUS MATTER—IT IS A SECRETION, NOT A TISSUE—DESCRIPTION OF TUBERCULOUS MATTER—CHEMICAL ANALYSIS—TUBERCULOUS MATTER FOUND IN DIFFERENT STAGES OF PROGRESS—SOFTENING AND EXPULSION—SCROFULOUS ABSCESS—RETAINED TUBERCLES—TRANSLUCENT OR FIRST STAGE OF TUBERCULOUS MATTER—EXISTENCE OF THE TRANSLUCENT STAGE DISPUTED—OF THE NATURE AND ORIGIN OF TUBERCULOUS MATTER—IS IT TO BE REFERRED TO INFLAMMATION?—EXPLANATION OF THE SYMPTOMS OF INFLAMMATION WHICH ARE OBSERVED IN CONNECTION WITH TUBERCLE—TUBERCLE SUPPOSED TO BE ESSENTIALLY CONNECTED WITH THE ABSORBENT GLANDS—ASCRIBED TO THE ABSORBENT SYSTEM—SUPPOSED TO BE CONGENITAL—ITS ORIGIN REFERRED TO HYDATIDS—PREDISPOSITION TO TUBERCLE—VARIES IN DIFFERENT AGES, CLIMATES, AND RACES—TUBERCLE NOT CONFINED TO MAN—MORBID APPEARANCES TO BE DISTINGUISHED FROM TUBERCULOUS MATTER—OF TUBERCULOUS FORMATIONS IN THE LUNGS—THEY OCCUR IN TWO FORMS—OF THE CAUSES DETERMINING FORM—OF MILIARY TUBERCLES—DESCRIPTION—OPINION OF ANDRAL AND LOMBARD—MODE OF COMMENCEMENT—MODE OF INCREASE—OF CRUDE TUBERCLES—OF THEIR FORMATION AND GROWTH—TUBERCLE A SECRETION RESEMBLING PUS—TUBERCLE UNORGANIZED—SOFTENING OF TUBERCLE, NOT SUPPURATIVE INFLAMMATION—OF THE MODE OF SOFTENING OF TUBERCLES—DOUBT AS TO ITS CONSTANTLY TAKING PLACE AT THE CENTRE—TUBERCLES SELDOM FOUND PARTIALLY EXCAVATED—CAUSES DETERMINING AND PRODUCING SOFTENING—PARTLY INHERENT IN THE TUBERCLE—PARTLY DEPENDENT ON THE SURROUNDING STRUCTURE—CHANGES IN THE SURROUNDING STRUCTURE—OF THE CAVITIES PRODUCED BY THE EXPECTORATION OF SOFTENED TUBERCLES—THEIR CHARACTER AND VARIETIES—SYMPTOMS CAUSED BY THEIR EXISTENCE—MORE FREQUENTLY COMMUNICATE WITH THE BRONCHI THAN WITH THE PLEURA—INFLUENCE OF PLEURITIC ADHESION—CONCOMITANT STATE—OF BRONCHIAL TUBES—OF ARTERIAL BRANCHES—OF PULMONARY VEINS—OF A REMARKABLE FORM OF TUBERCULOUS DEPOSIT IN THE LUNGS—ROUNDED MASSES TRANSLUCENT TOWARDS THE CENTRE, WITH OPAQUE SPOTS AT THE CIRCUMFERENCE—THE CENTRE SOMETIMES DETACHED—INFERENCE FROM THESE APPEARANCES—OF TUBERCLES COMBINED WITH A PECULIAR FORM OF EMPHYSEMA—THE EMPHYSEMA CONSECUTIVE—OF TUBERCULAR INFILTRATION—DESCRIPTION—A SEQUEL TO THE ISOLATED FORM—ILLUSTRATION OF THE INFLUENCE OF

NEIGHBOURING PARTS—PARTS LIABLE TO BE AFFECTED—TUBERCULAR INFILTRATION SOMETIMES PRIMARY—STAGES OF PROGRESS—PROOF OF THE INFLUENCE OF THE STATE OF THE SYSTEM—OF THE STAGES OF CRUDITY AND SOFTENING OF TUBERCULOUS MATTER—CONSEQUENT CAVITIES—OF TUBERCULOUS DEPOSITS SUCCEEDING TO PULMONARY INFLAMMATION—MORBID APPEARANCES FROM WHICH THEY ARE TO BE DISTINGUISHED—OF TUBERCLES WHICH DO NOT UNDERGO THE PROCESS OF SOFTENING—TUBERCLES SUPPOSED TO BE SOMETIMES ABSORBED—LAENNEC'S OPINION OPPOSED TO THIS—SOMETIMES RETAINED—PETRIIFIED—SUPPOSED INFLUENCE OF IODINE—PROTRACTED CASES—INDURATION OF LUNG ABOUT TUBERCULOUS CAVITIES—REPEATED OCCURRENCE OF SLIGHT PNEUMONIA—STATE OF THE PLEURA IN CONJUNCTION WITH TUBERCLES—VAN DER KOLK'S IDEA RESPECTING PLEURITIC ADHESIONS IN PHTHISIS—REMARKS RESPECTING PHTHISIS—FATAL INFLUENCE OF A VICIOUS MODE OF DRESS—COMPLICATIONS OF PHTHISIS—FAT LIVER—ABSTRACT OF THE RESULT OF LOUIS'S RESEARCHES.

GENTLEMEN,

ALTHOUGH the affection to which I shall call your attention to-day is nearly the last which I shall describe as seated in the substance of the lung, yet it is by no means the least important. When I announce to you that I am about to speak of tubercular deposits in the lung, I need scarcely tell you that they constitute the essence of pulmonary phthisis or consumption; perhaps the most untractable and fatal, and, in this and some neighbouring countries, the most frequent disease by which the flower of our youth is cut off.

In employing the word *phthisis* or *consumption*, I am aware that I am using a term which, in ordinary language, and even amongst the members of the medical profession, is applied to a variety of affections, which it is important, here at least, that we should not confound with each other. Thus, we have 'laryngeal phthisis,' 'tracheal phthisis,' 'cancerous phthisis,' 'melanotic phthisis,' 'calculous phthisis,' besides 'tubercular phthisis.'

Limitation
of the term
'phthisis.'

There are also several other affections, which, though not intentionally termed phthisis by the medical practitioner, are liable, inadvertently, to be confounded with this disease, by those who have neglected the very important means which we now possess to aid us in the once confessedly

difficult diagnosis of diseases of the chest ; such as, pleurisy terminating in empyema, some affections of the liver, and marasmus from causes more remote from the chest.

In confining myself in the use of the term 'phthisis' to those affections of the lung which depend on tubercular deposit, I am acting in strict conformity with the usage of the best pathologists of the present day. Even within these limits, we shall find that we comprehend no inconsiderable variety of morbid appearances ; which, though easily recognised as varieties, when they are brought under our view in inspections, are scarcely distinguished by name, either then, or during life.

The word
'tuberculous'
employed in
two senses.

In taking the deposition of tubercular matter as the essential characteristic of these affections, we meet with a fresh source of ambiguity in the term 'tubercular' ; which has been employed to convey two distinct ideas ; the one relating to form, the other to composition. Thus, with reference to the first idea, every deposit which has a defined and rounded figure, which is of moderate size, and dependent on the production of a new growth rather than a modification of an old one, is termed a *tubercle*. Hence we have cancerous, cerebriform, melanotic, and other tubercles, as well as scrofulous tubercles, and those nearly allied to them. This application of the term, although the most consistent with its etymology, is not so important, as descriptive of a class of diseases, as the somewhat forced construction which is put upon it, when it is meant to designate the peculiar nature and composition, rather than the form of the deposit. This meaning of the term, which has evidently arisen from the fact, that most tubercles in the lungs are composed of a particular material possessing certain characteristic peculiarities, was, I believe, first employed, as the name of a distinct class of adventitious deposits, by Laennec.

Sense attached to it on the present occasion.

As I shall here employ the word 'tubercular' in the sense which I have last mentioned—although, I confess, I do not fully approve of it—it seems necessary that I should offer a

few remarks on tubercular matter generally, before I take up its appearances in the lung in particular. It is the more necessary that I should do so, since I have, in the former part of the Course, dwelt for a considerable time on a class of adventitious structures essentially distinct from those productions which are termed 'tuberculous' in the restricted sense in which I am now employing the word.

OF TUBERCULOUS MATTER.

Although in commencing, by offering some general remarks on tuberculous matter, I am subjecting myself to this disadvantage, that I must refer to morbid appearances which I have not yet described, I am nevertheless induced to prefer this course to that of deferring the general remarks on this deposit until I shall have described the various appearances which it exhibits in different tissues and organs. This course presents the less of two difficulties; since you will all doubtless readily recognise the object which I am describing under the term 'tuberculous matter'; and, consequently, will be able to follow me in my general remarks; which will, I trust, have the effect of rendering the descriptions of its local appearances more clear and intelligible.

Of tuberculous matter.

Although I am following Laennec in the meaning which he attached to the term 'tuberculous,' I do not fully adopt his views with respect to the peculiar material which I am about to describe. He placed it along with the adventitious structures; such as, the cancerous, the encephaloid, and the melanotic: to which arrangement he was led by the observation, that they were formed in or upon pre-existing structures, and that they passed through the three stages of formation, crudity, and ultimate disintegration, preparatory to their expulsion from the body, as well as in their general tendency to affect the system, more or less extensively, after having made a more partial invasion. Admitting the general correctness of these observations, notwithstanding the existence of very characteristic differences in each

It is a secretion, not a tissue.

particular, I cannot recognise in tuberculous matter the essential characteristics of an adventitious structure, which really belong to the other productions which I have mentioned. It presents no trace of regular, much less of organized arrangement: it rather adheres to, than possesses, a regular attachment to the structures in which it is situated; and it is, consequently, unorganized. I have, therefore, constantly regarded tuberculous matter as a secretion, rather than a new structure: in fact, without admitting its invariable connection with inflammation, I believe it to be most closely related to pus and puriform secretions. In this opinion I am glad to have the concurrence of so experienced and distinguished a pathologist as Professor Andral: from whom, notwithstanding, I am under the necessity of differing in opinion on some points connected with the formation and stages of tuberculous matter.

Description
of tubercu-
lous matter.

Tuberculous matter, in its perfect state, is possessed of a certain degree of firmness and solidity; yet it has, in general, but little tenacity: hence it may be crushed between the fingers, and be regarded as friable. Its colour is opaque yellowish-white; which is not always uniform throughout the mass, but is occasionally slightly intermixed with some adventitious colour.

Chemical
analysis.

Thenard has given the following analysis of tuberculous matter:—

Animal matter	98.15
Muriate of soda	} . . . 1.85
Phosphate of lime	
Carbonate of lime	
Oxide of iron, a trace.	

A tubercle having a cretaceous character consisted of—

Animal matter	3
Saline matter	96

Form.

Although tuberculous matter, as its name indicates, is often met with in collections of a rounded figure, it is not unfrequently disposed in very irregular masses, in layers, and in various forms impressed upon it in cavities in which it is situated.

The collections of tuberculous matter are, at least, as various in size as in the forms which they assume. Sometimes tuberculous matter is seen in isolated portions, not larger than hemp or millet seed; whilst, in other instances, we may see it, in individual masses, as large as plover's or even hen's eggs, which, by their close aggregation, may constitute tumours as large as a child's head. Size.

Although tuberculous matter, in what may be regarded its perfect state, is admitted, on all hands, to possess the characters which I have above enumerated—namely, an opaque white colour, and a concrete yet friable texture, which may be compared to some kinds of cheese, or to the yolk of an egg at a certain degree of coagulation from heat—yet this is not the state in which it is supposed, by many, to exist in the earliest period of its formation, neither is it the state in which it is permanently to remain. With respect to its mode of formation and early appearances, there are discrepancies of opinion, which I shall presently relate. With respect to its ultimate tendency, it is on all hands agreed, that, except under particular circumstances, it exhibits a process of softening, by which a collection of tuberculous matter is converted into a grumous mass, sometimes closely resembling pus, yet more unequal in its consistence, and intermixed with irregular fragments much larger than the particles in pus. At other times, the fluid is in more considerable quantity; and so unequally diffused, that a broken-down and softened tubercle resembles whey intermixed with minute fragments of curd. It is this which gives the peculiar character to a scrofulous abscess; which is, in fact, nothing else than abscess dependent on tuberculous matter. This process of softening of tuberculous matter is subservient to its expulsion; for which purpose it is generally accompanied by ulcerative absorption of the living natural structure in which it is situated. This ulceration, as I shall hereafter mention, does not equally affect all structures, nor is it, in general, equally active on all

Tuberculous matter found in different stages of progress.

Softening and expulsion.

Scrofulous abscess.

Retained
tubercles.

points of the circumference of the deposit; but, on the contrary, it almost always predominates in that direction in which it may open a way of escape upon the surface of the body, or into some canal or cavity lined by mucous membrane. The exceptions to this process of softening and expulsion occur, for the most part, in those situations in which escape or expulsion could scarcely take place; as, for example, when tuberculous matter is deposited in the mesenteric and other deep-seated glands—as the bronchial, and some of the cervical. In such cases, the continual formation of tuberculous matter sometimes produces the large accumulations to which I have before alluded; or the process of its formation, being suspended, under the influence of improved general health or other circumstances, the tuberculous matter is progressively altered in its characters, and passes into a state in which it may permanently remain in a state of inactivity; and, instead of setting up a destructive ulcerative absorption, it excites the surrounding structures to the formation of a cyst, in which it is shut up, like a bullet, or any other inorganic foreign body. Within this enclosing cyst, the retained tuberculous matter is not always found precisely in the same state. Sometimes it is merely shrunk in size; and, though still friable, more firm and compact, from the loss of its watery parts: at other times, its composition is most materially changed by a copious deposition of earthy salts. It seems probable that this accumulation of earthy salts may depend upon the action of endosmosis and exosmosis; the fluids containing them passing more readily through the enclosing cyst, from the surrounding structures, than they are allowed to do in the opposite direction. There appears to be an analogy between the influence of the cyst enclosing these petrified tubercles, and that of the denser serous membranes, which favour the production of bony matter, as a sequel to inflammation, upon their attached surfaces*.

* See Vol. I.; and also a Paper, by the author, on the Formation of Bone, in the *Annals of Medicine and Vital Statistics*.

Although pathologists are pretty generally agreed as to the characters of tuberculous matter when formed, as well as regarding the changes which it may subsequently undergo, this is not the case with regard either to its incipient form or to the causes of its production.

In conjunction with the tuberculous matter, whether occurring in isolated rounded bodies of various sizes from that of millet-seed upwards, or in layers of greater or less thickness and extent, or in more amorphous collections, in which it exists diffused through pre-existing textures, it is by no means uncommon to find a translucent material, either coloured, or presenting different shades of grey, assuming the forms of the tuberculous matter with which it is associated. In fact, it is often found including the tuberculous matter, although it may also be seen by itself. Its degree of consistence admits of much variety: sometimes it is almost fluid, or admits of a colourless watery part escaping from it under pressure; but it is generally of greater consistence, and may almost possess the firmness of cartilage. This translucent substance has been regarded by Laennec as the incipient stage of tuberculous matter; and the enclosed portions of opaque tuberculous matter, which may be observed as small isolated spots, or in much larger quantity, constituting the greater part of the mass, are regarded by Laennec as the result of a change taking place in the previously effused and recent translucent substance. This opinion, which has been very generally adopted on the authority of Laennec, I believe to be strictly correct; although I am fully prepared to admit that there are cases in which the tuberculous matter appears to be at once deposited in that state of opacity to which Laennec has given the appellation of crude tuberculous matter. I shall have occasion to cite some examples of this kind, amongst tuberculous deposits in the lungs. The transition from the translucent to the opaque character is quite analogous with what we see occurring in other situations; some of which I have already pointed out in this Course of

Translucent
or first stage
of tubercu-
lous matter.

Existence of
the translu-
cent stage
disputed.

Lectures. Thus we see that the plastic lymph thrown out on the surface of serous membrane is at first translucent; but becomes opaque, if any cause occur to impair its vitality, and prevent its arrival at the condition of cellular membrane. We have also seen, that the material with which the adventitious cysts are filled, in fungoid disease, is at first translucent, whilst it admits of the elongation of vessels into it; but becomes opaque, as it loses its vitality, and proceeds to the stage of softening. Andral, however, disputes this transformation in the production of tubercles. He does not consider the deposit as tuberculous, until it exists as an opaque yellowish white substance: and though he admits of the occasional pre-existence of the translucent material which I have described as constituting the tuberculous matter in its earliest stage, he considers that this is not transformed, but displaced by the deposit of the real tuberculous matter within it. He calls in question the occurrence of the translucent material in some situations in which the production of tuberculous matter is remarkably frequent, more especially in the mesenteric and other lymphatic glands. I cannot suppress my surprise at this opinion of the learned Professor; since I am satisfied that I have often seen this material in its translucent stage in these bodies, which, like the lungs, are extremely liable to be the seat of tuberculous matter, both in the isolated and in the infiltrated form. In the scrofulous tubercles which are formed in the sub-serous cellular membranes, especially that of the peritoneum, or beneath false membranes produced upon its surface, we may often have opportunities of viewing the translucent material associated with crude tuberculous matter, under circumstances which favour the idea of its being the incipient or more recent form of the tuberculous deposit. I refer more especially to the conditions of size and situation. In large masses of tuberculous matter, such as are occasionally met with in the axillary and cervical glands, where the tumours have been of slow growth, and

have acquired a great firmness of substance, and contain very little moisture, we can scarcely expect to find tuberculous matter in its transparent state; yet, even in such cases, I have noticed, in the section of the tumour, a fine line of translucent appearance, at the junction of the crude tuberculous matter with the structure in which it is imbedded.

The fact is not only interesting, as connected with the question now under consideration, but it seems to throw some light on the accumulation of such masses of tuberculous matter, and to indicate their growth by means of super-position.

I shall revert to the consideration of opinions respecting the mode in which the softening of tuberculous matter takes place, when calling your attention to this change in pulmonary tubercles.

We may now turn our attention to the nature and origin of tuberculous matter; and pass, in brief review, the opinions of some of those pathologists whose investigations have been directed to this subject.

Of the nature and origin of tuberculous matter.

The most important view which has been taken of the formation of tuberculous matter, both as respects its probability and its influence upon practice, is that which regards it as the effect of inflammation. When we look upon tuberculous matter as a morbid secretion; and further observe, that in many of its characters it has an undoubted affinity to pus, the unquestionable product of inflammation;—when we see that its development, in situations which expose it to observation, is not unfrequently accompanied by some degree of irritation, the constant attendant of inflammation; and that the phænomena attendant on the process which is set up for its expulsion from the system, are almost identically the same with those which attend the spontaneous evacuation of deposits, the undoubted result of inflammation;—we cannot be surprised that some of the most distin-

Is it to be referred to inflammation?

guished and practical pathologists have advocated the inflammatory nature of tuberculous matter. Broussais, Cruveilhier, and Andral must be mentioned amongst the chief supporters of this doctrine; although the later publications of Professor Andral indicate some change having taken place in his opinions. A great part of the difficulty attending the settlement of this question does not so much depend on the phænomena connected with tuberculous deposits, as on the want of such a definition of the term 'inflammation,' as is sufficient completely to mark the precise limits of its application. As I shall not here attempt to encounter this difficulty, I cannot flatter myself that I shall be able to clear up your doubts respecting the inflammatory or non-inflammatory character of tubercles: nevertheless, as far as a practical object is to be obtained, it will not be difficult to arrive at some satisfactory conclusions. Unless we are willing to permit the term 'inflammation' to include all derangements of the healthy process of nutrition by which the vitality of parts and their molecular changes are affected, and to regard every alteration in their secretions, whether glandular or interstitial, as a product of inflammation, it is necessary to adopt some conventional limits to the meaning which the word 'inflammation' is intended to convey. Now, the etymology of the word—and, to a great extent, the technical as well as popular use of the term—connect it with a morbid increase of some of the vital phænomena of the affected part. I wish you to observe, that I do not say the vitality of the part is increased; for although this is asserted by many who have treated on the nature of inflammation, I am by no means convinced that such is really the case; and therefore advisedly limit my expression to the announcing of a palpable fact. The heat and sensibility of the part are increased; its vascularity, when ocular demonstration can be obtained, is rendered more than naturally evident; its size is augmented by the active accumulation of fluids in it. During a portion, at least, of the

time in which these conditions exist, the secretion of the part is increased in quantity, and variously modified in its properties. It is evident that a preternatural stimulus is exerting its influence, be it inherent in the part itself, or derived from some extraneous source. Like the act of combustion with which its etymology associates it, the part or parts in which this process is going forward has a tendency to induce similar changes in its immediate neighbourhood. Whether we regard the original seat of the inflammation, or the parts which it has affected by extension, it is certain that they are injured, impaired, and, if I may so say, rendered less powerfully vital than similar structures which have not been so affected. Hence arises a morbid proneness, either to the recurrence of inflammation, or to other derangements of the nutrient function to which this term may not be strictly applicable.

The curative means employed to arrest or modify inflammation, in the sense to which I am now confining the term, though very various, have, with little or no exception, one tendency in common; viz. to counteract the excitement which the preternatural stimulus has produced; by diminishing heat; by reducing the quantity and quality of the nutrient fluid, either generally or locally; by blunting the sensation of pain, which itself becomes a local stimulus; or by removing the tension on which it partly depends. According to the activity of the inflammation, the importance of the organ in which it is seated, the condition and constitution of the patient, and the bias which may exist in the mind of the practitioner with respect to the employment of active treatment, will antiphlogistic, depleting, and reducing measures be more or less freely and generally employed. The practical inconvenience to be apprehended from the too extended use of the term 'inflammation,' is, that it may suggest the idea that the remedies to be employed are necessarily to be sought in the antiphlogistic, reducing, depressing, and evacuant classes; which, to the patient, may

prove a source of fatal error. Our practical inquiry, with respect to the inflammatory character of tubercle, is reduced to this; viz. whether it be essentially connected with those symptoms which call for the employment of remedial measures possessing the characters which I have just described as belonging to the opponents to inflammation, or not. Our first question must therefore be, not whether some of the symptoms of inflammation may not at times concur with the formation of tubercle; but rather, whether unquestionable tubercular formation may not take place without their concurrence. This question must, I believe, be answered in the affirmative. It is by no means uncommon to find a multitude of those small tubercular formations, which I shall have to describe to you as miliary tubercles, sprinkled more or less extensively through the lungs of individuals in whom the previous symptoms have excited no suspicion of pneumonia or bronchitis. In the tubercles themselves we discover no indications of the afflux of blood, or other appearance ascribable to irritation; and as respects the surrounding pulmonary structure, it is often so spongy and crepitant, so pale, and even so exempt from the preternatural presence of fluids of any kind, that so far from being led to the belief that an inflammatory stimulus has existed in the spots themselves, which would more or less have extended its influence to the adjoining structures, we may even be surprised that more effect has not been produced by their mere presence as adventitious bodies. Again, we may observe the notable increase of tumours dependent on tuberculous matter; as, for example, of such as are seated in some of the lymphatic glands, which proceeds without inflammatory symptoms, and which is not arrested by local or general depletion; but which, on the contrary, seems, as far as it is at all controllable, to be arrested by medicines of a tonic class, and by adherence to dietetic regulations of an invigorating tendency, which could not be enforced with impunity in those cases in which the existence of phlogosis

or inflammation would be unhesitatingly admitted. Moreover, we frequently observe a commencement or marked increase of tubercular deposit to take place where some cause, having a reducing or depleting tendency—such as, profuse evacuations, poor and scanty diet, unhealthful situations, and depressing passions—have been known to have been in operation: and no individuals are observed so readily to yield to such injurious influences, and exhibit their effects in the production of the various forms of tubercle or scrofula, as those who possess, by inheritance, feeble, lax, lueophlegmatic constitutions, who are intolerant of depletion, and who are as strikingly benefited by an opposite, invigorating, and nutritious system of management.

With respect to those inflammatory symptoms which may be observed either as antecedent to or consequent on tubercular deposits, it seems probable that, in the first case, the inflammation is independent of tubercular formation, and is excited by cold, or exposure to some other cause capable of inducing that state: but taking place in individuals having the character before mentioned, or in a structure impaired by previous disease, the process of inflammation does not advance, in its ordinary course, either to resolution, to the effusion of plastic lymph, or to the production of genuine pus. In some respects, the formation of tuberculous matter seems to be between the two last-mentioned results. It differs from the deposition of plastic lymph, in the want of susceptibility of organization, and, consequently, in not forming a new and permanent tissue: and it differs from the ordinary production of pus, in consisting in the conversion of the originally effused material, and in not being the secretion from an altered texture specially modified for its production; although, at a subsequent period, the increase of tuberculous deposits appears to take place by a process of this kind. With this view, it is not irrational to seek to arrest the formation of tubercle, by antiphlogistic means, where inflammatory symptoms occur

Explanation of the symptoms of inflammation which are observed in connection with tubercle.

in individuals in which this result may be apprehended. But it is evident, that we have here a choice of evils—that these measures ought to be employed to the least possible extent which can suffice to accomplish the desired end—and that, as soon as possible, they should give place to treatment of a tonic, and even somewhat stimulating, description.

With respect to the inflammatory symptoms which succeed the deposition of tuberculous matter, they cannot be admitted as giving any support to the opinion that the affection is essentially inflammatory; since they can only be regarded as the consequences of the presence of any foreign body whatsoever; and the extreme indolence and low degree of irritation which attend these deposits, even when of large size, provided they do not exist in a part of vital importance or great sensibility, furnishes an argument against, rather than favourable to, the doctrine of inflammatory origin.

Tubercle
supposed
essentially
connected
with the
absorbent
glands.

It has been supposed, that tubercular formations are essentially connected with the absorbent glandular structures; and the development of tubercles has been used as an argument in favour of the existence of these bodies, in situations in which, in the healthy state, their presence cannot be demonstrated. There is no doubt that these bodies are very apt to become the seat of tubercle—that its production is accompanied by a great development of these bodies—that, from this cause, glands, which might easily have escaped observation, become very conspicuous. Tubercles in the spleen may possibly, with reason, be supposed to take their origin in minute bodies of this kind, but which are usually imperceptible; since such bodies, supposed to be of the nature of lymphatic glands, yet not proved to be so, may be shewn to exist in the spleens of some inferior animals in the perfectly healthy state of the organ. This reasoning is, however, decidedly incorrect, when applied to tubercles in the lungs; as you will at once admit, when I describe the early state of these bodies. It

is still more obvious, that this theory is altogether untenable, when applied to the infiltrated form of tubercle, as well as to its deposition in false membranes upon the serous membranes. An opinion nearly related to the preceding has been advanced in the theory, that the production of tuberculous matter, though not limited to the absorbent glands, is closely connected with the system of absorbent vessels, of which these glands are a part. It is true, that there often exists a great want of activity in the absorbent function, and, as it would appear, a morbid conspicuousness in these vessels, as well as their glands, in those individuals who possess a strong and general tendency to struma; but I am not aware of any other pathological facts which tend to fix the formation of tuberculous matter upon the absorbent, in preference to any other system. It is true, that absorbent vessels in the mesentery, the lungs, and elsewhere, have been seen to contain a cheesy matter, regarded as tuberculous; but such appearances may also be found in the veins, and much more frequently in cavities and ducts lined by mucous membrane; such as, the Eustachian and Fallopian tubes, the pelves of the kidneys, (according to Dr. Carswell,) and the tubuli seminiferi.

Ascribed to
the absor-
bent system.

Another view, adopted by a very laborious and practised pathological observer, refers the formation of tubercle to the foetal state; and supposes that they remain dormant during the period which elapses between that state and their development, in the production of phthisis, or other disease dependent on tubercle. Whilst the researches upon which this theory is grounded not only attest the careful scrutiny in which its author has been engaged, but shew the early period at which the hereditary predisposition to disease may be called into activity, they are far from going to the extent of proving the inference which has been drawn from them: an inference which is so completely refuted by the fact to which I have already alluded—of tubercles being formed in false membranes—that I deem it quite needless to

Supposed to
be congeni-
tal.

adduce any additional arguments which might be brought against it.

Its origin
referred to
hydatids.

There yet remains one other theory to advert to, in connection with the supposed origin of tuberculous matter. Dr. Barron, in this country, and Professor Dupay, in France, have referred to hydatids as, in some way or other, giving rise to the production of tubercles. If you will recall to mind the description of these parasitical animals—for such, I believe, they must be considered—if you will trace the series of phenomena which attend their production, growth, and death, and their expulsion from the system when this takes place, and more especially the influence which they exert upon neighbouring parts, and the rarity of the concurrent derangement of distant organs and textures—you cannot fail to observe the manifest difference between cases connected with hydatids, and those which depend on tubercle. Again, cases of hydatids are far from being of frequent occurrence*, whilst those of tuberculous formation are perhaps the most frequent which come under our observation; and yet, even the rare cases of hydatids are by no means constantly associated with tubercles—a fact which seems fatal, not merely to their identity, but even to any relationship between the two affections. In the work of Dr. Barron, you will find collected many highly interesting and valuable cases, but no support of the doctrine with which you will find his name associated in the writings of very many pathologists, both of this and foreign countries: you will find the term ‘hydatid’ applied to a variety of totally distinct objects: and the cases related, by way of illustration, are by no means confined to those which depend on tubercle, in the sense in which the word is here employed, but are referrible to many totally distinct diseases. I apprehend the source of the Doctor’s error to have been, a too hasty conclusion, drawn from observations made on a few inferior animals; in which circum-

* I have not seen hydatids in the human lung more than four or five times. Andral found them five times in about six thousand patients.

stances unfavourable to healthy nutrition may at the same time have promoted the propagation of parasitical animals—disease of the lymphatic system—and the production of tuberculous matter, without there being any direct and necessary connection between the three results.

If Professor Dupay be really an advocate of the hydatid origin of tubercle as a general principle—which I am rather disposed to doubt—it would seem that he has been led to adopt the conclusion from not having distinguished the friable material situated between the hydatid membrane and the inclosing cyst derived from the surrounding structures—a material which, though originally deposited in a very thin layer, becomes accumulated into a mass somewhat resembling tuberculous matter, though more like mortar, when the hydatid dies, and, being shrivelled up on the absorption of its contents, allows of the contraction of its inclosing cyst.

In some of the remarks which I have already made, I have adverted to the fact, that different individuals are very differently predisposed to the production of tubercles; and I have pointed out the kind of constitution most favourable to it. I may further add, that the tendency is not equally great in all periods of life, but that it is most strongly marked in infancy, childhood, and adolescence. It is an important fact, that it may be greatly promoted or checked by climate and situation; the most predisposed frequently escaping, if they spend the critical period of their lives in warm and favourable climates; whilst the inhabitants of inter-tropical and other warm regions are very apt to be cut off by pulmonary consumption, and other tubercular affections, when they come under the influence of our less genial and very variable climate. The most striking illustrations of this remark occur in the persons of negroes, and other individuals of the coloured races. This lamentable and notorious fact—although it ought not to induce us wholly to deprive such individuals of the inestimable benefits which they

Predisposition to tubercle,

varies in different ages,

climates,

and races.

might derive from visiting this country under suitable management—should certainly stimulate us to the discovery and employment of the means best adapted to counteract the tendency in question.

Tubercle not confined to man.

Tuberculous affections are by no means confined to man: monkeys are peculiarly prone to them; and the specimens of various species which are brought to this country for exhibition are almost invariably cut off by pulmonary and abdominal affections of this class. A similar remark applies, though not to the same extent, to many other animals brought from warm climates; and our own domestic and indigenous animals are by no means exempt from tuberculous diseases.

Morbid appearances to be distinguished from tuberculous matter.

There are some appearances which present themselves to our view, in making inspections, which, from their resemblance to those which depend on tuberculous deposit, it seems expedient that I should briefly enumerate, as a caution against their being mistaken for each other. In reference to this subject, I would also particularly recommend to your attention some of the observations and descriptions which I offered when speaking of colour, and in the course of those Lectures which related to the subject of malignant disease.

The following, I apprehend, comprehend the principal, if not all the cases in which tuberculous matter may be erroneously supposed to exist:—

1. Plastic lymph which has been effused, but, from some cause, has lost its vital properties, become insusceptible of organization, and is retained as a whitish opaque foreign body. Examples of this kind, in which mistakes may be made, occur in the serous membranes, in the cellular membrane, and in some cases of abscess.

2. Collections of extravasated blood, in which the colour, passing through various shades of brown and yellow, has become nearly extinct, producing a mass of a yellowish-white colour; and which, in their consistence, bear some resemblance to compact, indolent, tuberculous matter.—

Instances belonging to this head are met with in the lungs, spleen, liver, kidneys, amongst the muscles, &c.

3. The remains of abscesses from which the matter has been imperfectly or not at all evacuated by opening, but from which absorption has removed the watery parts, leaving the solid unabsorbable parts concentrated into a dense friable yellowish-white substance, inclosed in a cyst or capsule, and often accompanied with the puckering of the corresponding part of the surface of the organ in which such deposit exists. The liver may be adduced as exhibiting cases of this kind.

4. The inspissated secretions of glands, and collections of a similar character, accumulated in passages lined by mucous membrane, and in sinuses and cavities of accidental production. Some of these collections may be truly tuberculous, as Dr. Carswell has stated; but others must, I conceive, be regarded as distinct; amongst which, I would mention some of the collections of friable matter found in the infundibula and pelves of the kidneys, and collections of a somewhat similar consistence found in the contracted cavities of lungs, which appear to have been affected with pneumonia of the non-plastic character, rather than with tubercular phthisis.

5. A peculiar enlargement of the lymphatic glands accompanying the large arteries: this hypertrophy, not only in its seat, but in some of its characters—inasmuch as it presents, first a translucent, and then nearly an opaque appearance—bears so strong a resemblance to the simplest form of scrofulous enlargement of these glands, that it is not always easy to draw the line of demarcation, nor would I assert that the affections are wholly distinct; yet, as the cases in which this peculiar glandular enlargement takes place present many peculiarities, and never, to my knowledge, tend to an ulcerative stage so common to tubercular deposits, or even induce an inflammatory state of the immediately-adjoining textures, I cannot help thinking it

necessary, at least in a practical point of view, to make the distinction which this enumeration is designed to inculcate*.

6. A particular state of encephaloid or fungoid matter, which appears to be the result of its passing from the translucent state, in which it is susceptible of some degree of organization, into a state in which it has lost its vitality and become opaque, but exhibits no tendency to undergo the breaking-down or softening process, and, consequently, seems to admit of continuance for an indefinite period, in a state of perfect inertness as respects itself and the surrounding structures. I will not decide whether this state of fungoid matter is to be ascribed to any peculiarity in the material composing these specimens, or whether it be not rather due to some accidental circumstance connected with its position in the mass; yet I am inclined to believe that something is due to the latter cause, since fungoid matter, in the particular state to which I am alluding, is found in the interior of masses of fungoid growth: in this situation it appears to have had its vitality destroyed by the compression of its nutrient vessels, without the immediately surrounding material having any destructive irritation induced as the consequence.

7. The peculiar material, to which I have already called your attention, in connection with the supposed hydatid origin of tubercles. I need not repeat what I have already advanced, both in reference to that view, and when treating more in detail in the Lecture on parasitical animals. I need only remind you, that the *débris* of the hydatid membrane itself may become so completely corrugated and shrunk, as to elude detection, without very careful examination. Temporary maceration in water may assist, by rendering the true characters of the *débris* more visible.

* See the author's paper on this affection, in the Transactions of the Medical and Chirurgical Society.

OF TUBERCULOUS FORMATIONS IN THE LUNGS.

Tuberculous deposits in the lung may be arranged under the two following forms; which have been established, if they were not first pointed out, by Laennec. In the first, the tuberculous matter is collected into masses originally isolated, having a rounded form, and varying in size, from that of millet-seed to that of a pullet's egg, or perhaps larger. In the second form, the tuberculous matter is more irregularly diffused through the pulmonary texture, and is therefore spoken of as infiltrated. Both of these forms present several varieties; which, in all probability, do not depend on any essential difference in the complaint itself, but rather on the individual or the organ affected, and perhaps, also, on the mode of commencement.—This observation leads me to a remark, which, though applicable to several other parts besides the lungs, I do not know that I can better introduce than in this place.

Tubercular
deposits oc-
cur in two
forms.

It seems that the morbid appearances occurring in a particular texture or organ, besides the peculiarities dependent upon, and indicative of, the particular disease from which the derangement proceeds, derive characters more especially connected with form from causes inherent in the affected texture itself, the influence of which may be seen in combination with different affections. These peculiarities may sometimes be referred to structural or anatomical causes which are sufficiently obvious: as, for example, the definite form of some partial affections of the pulmonary structure, which evidently depend on the structure of the lung, composed of numerous lobules, having cellular membranous septa between them; which, whilst they serve to unite the whole together, as one organ, or rather lobe, nevertheless present a barrier to the spread of disease. In some other instances, the circumstances on which the peculiarity of form depends, are neither obvious, nor have they yet been discovered. Thus, whilst the lobular pneumonias and lobular apoplexies are sufficiently explicable, that rare form

Of the causes
determining
form.

of extravasation of blood in the lungs, which I have already described to you as exhibiting numerous small ecchymosed spots scattered through the pulmonary texture, remaining free from sanguineous effusion, indicates a limiting cause, which we are not only unable to point out, but of which the operation in this case seems difficult to conceive. It is difficult, I say, to conceive how a fluid effusion like that of blood taking place in the texture of the lung can be limited to a spot not larger than a pepper-corn, and not at least have diffused itself through the lobule in which it occurred. The force of this observation remains unimpaired, whether the blood may have escaped from its vessels at these spots, or only have been lodged in them after entering the lungs by the air-tube. We see something like the influence producing this particular form of pulmonary apoplexy in the formation of miliary tubercles, and in the scattered spots of black pulmonary matter. You will recollect that the idiopathic form of pulmonary apoplexy causes portions of lung to be consolidated by the effused blood; and that these portions, instead of being limited by the septa between the lobules, assume an irregularly-rounded figure. We shall have to notice a similar arrangement sometimes occurring in the deposition of tuberculous matter. It is not in the lung only that striking illustrations of this principle are frequently met with. It is no where more evident than in affections of the skin: thus we find several of these giving rise to diffused discolouration, but more especially to phlogotic redness: many more occasion the production of spots; and although these spots vary considerably in their individual appearance, dependent on the particular causes which give rise to them, there is nevertheless, in their distribution as well as in the mere production of spots, something which seems to indicate an influence inherent in the texture itself.

MILIARY TUBERCLES.

These tubercles, which are so called from their resemblance, in respect of size, to millet-seed, are the smallest, but perhaps at the same time the most perfect specimens of tubercular deposit. As such, I have already referred to them for the solution of the question, whether the production of tubercle is to be regarded as essentially an effect of inflammation, or not. Miliary tubercles, when apparently of the most recent formation, vary in size, from that of a pin's head to that of a pepper-corn, have a tolerably round defined form, a translucent greyish colour, and sufficient firmness to give the idea of a perfectly solid body, strikingly contrasting with the spongy crepitant texture of the lung in which they are imbedded. They appear to be perfectly exsanguine themselves; and the surrounding structure of the lung frequently exhibits no discolouration, and generally no sensible deviation from the perfectly healthy state. It is by no means uncommon to find lungs thickly sprinkled with these tubercles, remarkably exsanguine, and in other respects quite healthy. It has been stated by some distinguished pathologists, who have paid special attention to this subject—amongst whom we may mention Andral and Lombard—that miliary tubercles, in their earliest state, consist of a minute vesicle; in fact, that a miliary tubercle may be regarded as an air-cell filled and distended with a transparent or semi-transparent fluid. I have often in vain looked for any appearance calculated to support this opinion. No doubt exists in my mind, that a miliary tubercle, in the earliest stage at which it presents itself for observation, consists of a minute portion of pulmonary texture, infiltrated by a transparent or translucent substance of a solid or nearly solid consistence, not confined to one cell or cavity, but rather occupying a few of the very minute areolæ of the spongy texture in which the bronchial tubes terminate. I have never discovered any thing like cyst or capsule limiting their size or volume. The mode in which

Description
of miliary
tubercles.

Opinion of
Andral and
Lombard.

Mode of
commence-
ment.

Mode of
increase.

they increase in size is not very evident: it is probable that it is principally by additions, at their circumference, surrounding portions of the spongy texture becoming progressively infiltrated with a similar material*: yet it would also appear, that either a kind of interstitial growth, or a super-position from the immediately adjoining structure, is somehow effected; since, when these tubercles are numerous, and have so far increased in size as no longer to come under the description of miliary, the intervening substance of the lung appears to be pushed aside and condensed, and also to be of a deeper grey colour from an approximation of numerous particles of black pulmonary matter.

They vary
in size, num-
ber, and dis-
tribution :

are pro-
duced in
successive
crops.

Miliary tubercles do not merely present differences as to size: there is also great variety in their number and extent. Sometimes they are few, and thinly scattered; sometimes very numerous, and generally diffused through both lungs: they are frequently more numerous and further advanced in one lung or lobe, than in other parts of the chest; but it is rare for their existence in the lung to be absolutely partial. As far as it is possible to judge from the appearances which they exhibit on inspection, it is evident that they are liable to be produced in successive crops, since we meet with them of different sizes, and at different stages, in the same subject. They are unquestionably formed in a latent and insidious manner; and though there are symptoms which, singly or collectively, may lead us more or less confidently to suspect their presence, we are still in ignorance of unequivocal tokens of the commencing existence in previously healthy lungs. We may often see a numerous and general sprinkling of these bodies in the lungs of those who have sunk under a more-advanced form of phthisis; but in such cases it is impossible to separate the symptoms which may

* This idea is more in accordance with the opinion of Andral, as given in the last edition of his 'Clinique,' than with the idea which I had formed of his views from his previous publications.

have depended on their formation from those which were more immediately connected with the softening and expulsion of large tubercles. Miliary tubercles are not confined to any age: they are not uncommon in the lungs of children, and have been repeatedly found in those of the fœtus. It is probable that they may remain for a considerable time in an inactive and nearly stationary condition; but how long this may be the case, is uncertain. There is, perhaps, no form of tuberculous deposits more strongly characteristic of an hereditary or constitutional tendency to these affections than that of miliary tubercles in the lungs.

Whilst the miliary tubercles are yet of small size, they begin to present opaque yellowish-white spots at or near their centres. This appearance was, not without reason, regarded by Laennec as indicative of their transformation into the state of crude tubercles.

CRUDE TUBERCLES.

When tubercles, instead of presenting the semi-transparent appearance which I have stated to characterize miliary tubercles, are of an opaque, dull, yellowish-white colour, in which state they are generally considerably larger than the miliary tubercles, they have been called crude tubercles. It is probable that these tubercles, which vary in volume from that of the largest-sized miliary tubercle to that of a filbert or cob-nut, may sometimes, as Laennec has taught, be the result of the growth of miliary tubercles, sometimes dependent on the increase and development of one tubercle, whilst at other times they have been evidently produced by the coalescence of several small tubercles; yet I cannot adopt the opinion that this is constantly, or even generally, the case. I am rather led to believe, by the appearances which I have often observed, that the isolated roundish tubercles are much larger than miliary, even in their earliest stage.

Mode of formation and growth.

The growth of these tubercles, arrived at the stage

of crudity, is a very obscure, but at the same time a very interesting subject.

It is very obvious, from what we have seen in cases of peritonitis accompanied with the production of tubercles, that the formation of these bodies does not require any very complicated or even organized apparatus; since crude tubercles are found sprinkled through the comparatively recent false membranes and bridges of adhesion; in which situations they not unfrequently acquire a considerable size, shewing that they are not the result of a mere transformation, but are the subjects of an unequivocal growth and development. This, I conceive, must mainly, if not solely, be attributed to the parietes of the cavity pouring out a secretion in many respects resembling pus; to which tuberculous matter is, in fact, very closely allied, if it be not, strictly speaking, merely one of the varieties of this substance. With this view, tuberculous matter cannot be regarded as an adventitious tissue. This opinion, which I have already advanced in the Preliminary Remarks, though opposed to that of Laennec, Bécclard, and some others who have copied from him, is quite in accordance with that of Andral, who, in my judgment, has very properly separated tubercle from the heterologous structures, and ranked it amongst the secretions. If this idea be correct, it will remove much of the difficulty connected with the growth of these bodies. It tends, I conceive, to favour the suspicion, that endosmosis and exosmosis perform an important part in the development of these bodies, and renders it increasingly probable that these two functions likewise operate in producing the further changes which these bodies undergo. You will of course infer, from what I have already advanced, that I do not regard crude tubercles, or, in other words, genuine tuberculous matter, as possessed of organization, or in any way susceptible of injection. This point is, indeed, too important to be taken for granted. Attempts at injection, which have been made in the most careful manner

Tubercle—
a secretion
resembling
pus.

Tubercle—
unorganized.

and with the finest materials, have proved altogether fruitless. A slight appearance of colouring matter may, it is true, sometimes be observed in the interior of a tubercle; but this is, I believe, to be ascribed either to a vessel existing before the deposition of tuberculous matter in the texture which it infiltrates, or to the extravasation of a small quantity of the injection; but neither of these is by any means a common occurrence. In rejecting the organization of tubercles, we must, as a necessary consequence, also reject that explanation of their changes, which ascribes them to inflammation. It is then, I conceive, somewhat forcing the Hunterian doctrines, to say that the tubercle becomes the seat of suppurative inflammation, the effect of which is to convert a crude tubercle into a cavity containing pus; yet I have known an objection raised on this ground to the doctrines of Laennec on this subject, when he refers this change to what he terms 'the softening of tuberculous matter.'

Softening of tubercle not suppurative inflammation.

I now proceed to speak of the softening of tubercles. — Although we do not know the length of time which a tubercle may remain in the state of crudity, yet we have constant evidence that it is not a permanent state, and that the tubercle is, in most cases, sooner or later converted into a cavity.

Of the mode of softening of tubercles.

It appears that the tuberculous matter softens and breaks down. This change is said to take place in the centre of the tuberculous matter; but upon this point I am not convinced by personal observation; for, notwithstanding the lamentable frequency of the disease, and the fact that the numerous tubercles which in most instances are more or less thickly dispersed through the lungs of consumptive patients do not advance simultaneously, but at different periods, to the stage of softening, I think it is a rare circumstance for us to find a tubercle partly crude and partly broken down; whence I suspect, that when the softening of a tubercle commences, it may either do so in several points at once, or that the process proceeds with

Doubt as to its constantly taking place at the centre.

Tubercles seldom found partially excavated.

Causes determining and producing softening:

partly inherent in the tubercle;

rapidity to change the whole tubercle, and prepare for its expulsion. The causes which determine the softening of tuberculous matter still remain to be ascertained. I have already stated my dissent from the idea that it depends on the suppurative inflammation of the tubercle itself; but if we reject this cause, to what is it to be ascribed? I confess, that though, when we advance beyond the simple fact that the softening takes place, we enter upon mere speculation, yet I am inclined to believe that the softening is in part dependent on the tubercle itself, and in part on the surrounding structure. I believe, that in the tubercle itself a change may take place from the solid to a softer state, without its receiving any addition to its fluid parts, merely in consequence of a different arrangement of its constituents. Many instances might be adduced of animal as well as vegetable substances possessing positive solidity whilst yet alive, or retaining in degree the properties which vitality conferred upon them, which yet, when death has led the way to decomposition, pass into a soft grumous or even fluid state. The substance of the brain, the crystalline lens, the cerebriiform matter produced by fungoid disease, and the crassamentum of the blood, may be adduced as examples of substances undergoing this change out of the body, and absolutely under our eye. The medusa or jelly-fish may be adduced as another instance of the kind. This animal, when alive, has considerable firmness, though it is nearly or quite transparent. After death, it undergoes complete solution, and appears only to leave a depression in the sand where it had lain,—so small is the amount of solid matter which enters into its composition. I believe that a crude tubercle, in like manner, owes its solidity to that which, for want of a more definite expression, I shall style a particular but unexplained mode of vitality, from the loss of which it passes into a grumous or softened state. It is evident that the surrounding structures concur in the change which is going on. It is well known, that during life a more or less con-

siderable increase in the constitutional derangement occurs about the time when, from the character of the sputa, we are induced to believe that the softening and expectoration of a tubercle is taking place. I have also heard it remarked by Collin, who was assistant to Laennec when I attended his practice in the Hospital of Necker, that he frequently detected partial pneumonias, indicated by the occurrence of crepitant rattle in phthisical patients. Both of these facts appear to me to point out the existence of a local irritation connected with the change going on in the tuberculous matter; of which it may be sometimes the cause, and at other times the effect. The communication which is ultimately formed by ulcerative absorption between the softened tubercle and a bronchial tube, by which the expulsion of tuberculous matter is provided for, is a further evidence, exhibited to us during life, of a change going on in the neighbourhood of a tubercle. When the death of the patient affords us the opportunity of furthering this inquiry by inspection, we have ocular demonstration of the alteration of the texture of the lung about softened tubercles. Sometimes it is in a state of recent inflammation; sometimes it exhibits different degrees of consolidation which subsided inflammation has left; and not unfrequently the consolidation of the substance of the lung is produced by a further and more recent deposit, which I shall presently have to speak of as tubercular infiltration. It cannot be doubted, that the local irritation, by which most of these changes must be accompanied, is attended, like other irritations, by an afflux of fluid to the part; some of which fluids are likely to reach and infiltrate the softening tubercle, and contribute to accelerate the process. The ulcerative absorption, by which the softened tubercle is furnished with a way of escape by communication with a bronchial tube, appears to be perfectly analogous to the operation of the same process, in providing a way of escape for collections of pus, scrofulous or tuberculous matter, through the common integu-

partly dependent on the surrounding structure.

Changes in the surrounding structure.

ments, or into the alimentary canal or urinary bladder. When the expectoration of the softened tuberculous matter is thus provided for, we may occasionally detect in the sputa portions of the friable material, which leave no room for doubt, had it previously existed, respecting the nature of the patient's affection. There is also, at the same time, a very slight admixture of blood, often scarcely amounting to more than two or three small streaks; yet it is this circumstance which has repeatedly given me the first intimation that the softened tubercles were communicating with the bronchi.

OF THE CAVITIES PRODUCED BY THE EXPECTORATION OF
SOFTENED TUBERCLES.

Their character and varieties.

The cavities formed by this process do not present ragged parietes composed of the excavated spongy texture of the lungs. The sides of these cavities are, on the contrary, well defined, tolerably smooth, and having a soft, whitish, friable lining, to which Laennec gives the name of a false membrane; but I am rather disposed to doubt its claim to this appellation, and rather regard it as a mere secretion deposited upon the interior of the cavity. When this lining is carefully removed, the surface then exposed is found tolerably smooth, and consisting of condensed pulmonary structure, generally of a livid colour. The appearance of these cavities varies considerably, in accordance with the differences of form which may have been assumed by the tuberculous matter, the softening of which has given rise to them. When numerous and isolated tubercles have undergone this process, the substance of the lung is found more or less thickly sprinkled with circular or elliptical cavities, varying in size from that of a pea to that of an almond, or larger; some of which are nearly or quite empty, whilst others exhibit every variety of secretion, from mucus to tuberculous matter. The intervening substance of the lung at the same time exhibits almost every possible

variety in colour and consistence, being sometimes spongy and crepitant, sometimes in a state of sanguineous engorgement, or presenting the several varieties of pneumonic hepatisation, or tubercular infiltration in the transparent or opaque form. The varieties in its appearance are also modified and increased by the proportion of blood, venous or arterial; or by the quantity of black pulmonary matter, dependent on the age of the patient, on previous pulmonary affection, or on the duration of his last fatal malady. Lungs in this state have sometimes been called *criblés*, and have been compared to a honeycomb; but they bear a much stronger resemblance to certain volcanic amygdaloidal rocks, in which the cavities have received a lining from crystalline and other deposits. In other cases, the tuberculous cavities are not so generally scattered, but are met with in close approximation in particular parts of the lung, more especially towards the apices of the upper lobes. Here they not unfrequently communicate with each other, either directly, or through the intervention of large bronchial tubes; and large irregular infractuious cavities are the result. Such tubercular excavations have been called ‘multilocular cavities.’ Sometimes cavities of large size, equal or superior to that of the last-mentioned cases, are produced by the softening and breaking-down of considerable masses of tuberculous matter, which may have been deposited either in the isolated or infiltrated form. Such cavities are much less irregular than the preceding variety, and not unfrequently possess a well-defined spherical figure. Since both of these last-mentioned varieties for the most part communicate with the air-tubes by large direct openings, they are likely to present the symptom called ‘tubular respiration,’ when the corresponding part of the chest is examined with the cylinder. For the same reason, if the patient speak during this examination, his voice is heard to pass directly from the chest along the tube, constituting some variety of pectoriloquism or metallic tinitus; the latter symptom

Symptoms
caused by
their exis-
tence.

appearing to require, for its production, the presence both of air and of liquid secretion : yet it must be observed, that the peculiar physical conditions essential to give rise to this symptom require further investigation. The pus or puriform mucus which is commonly present in these cavities is the cause of another very characteristic symptom ; viz. a kind of gurgling, produced by the movement of the air in respiration. It may however happen, that the secretion, from its quantity or quality, either fills the cavity, or obstructs the tube leading to it, and occasions, whilst this condition lasts, the suspension of the stethoscopic symptoms just enumerated : hence the importance of repeated examination under different circumstances, as respects the state of the patient. It sometimes happens, that a tuberculous excavation is situated so near to the surface of the lung, that its external parietes merely consist of pleura, with a very thin layer of pulmonary substance : in such cases, pectoriloquism may fail to be produced—a fact which Laennec very reasonably explained, by ascribing it to the collapse of the thin and flaccid external wall of the cavity. It is in cavities similarly circumstanced to those which I have last noticed, that we meet with the rare phenomenon of softened tubercles opening their way into the bag of the pleura. Such occurrences were supposed to be the common cause of empyema ; an error to which I have already adverted, in speaking of pleuritis. Inflammation of the pleura must indeed be the natural consequence of such an opening ; but, as it must almost always happen that there is at the same time a communication with the bronchial tubes, air, as well as softened tuberculous matter, escapes into the pleura, giving rise to pneumothorax.

More frequently communicate with the bronchi than with the pleura.

Influence of pleuritic adhesion.

Independently of the far greater tendency which there exists in softened tubercles to communicate with the bronchial tubes than with the pleura, the chances of this latter communication are diminished by the very common complication of partial pleuritic adhesions, by which the portion of

lung containing tuberculous deposits are firmly united to the corresponding parietes.

The modes in which the bronchial tubes and the sanguiferous vessels are affected by the changes produced by the deposition of tuberculous matter merit particular attention. From what has already been said with respect to the communication between tuberculous cavities and bronchial tubes, it must be obvious that the opening into the latter is readily effected. It appears that even the larger divisions of the bronchial tubes offer little or no resistance to this process. It would seem that the bronchial tube is already truncated; and opens at once into the tubercular cavity, as soon as the latter is formed. I have neither seen nor heard of a partially-destroyed bronchial tube projecting into such a cavity: whence it would appear that the change in the bronchial tube proceeds at the same time, and in exact relation, with that in the tuberculous matter and the portion of lung which it affects. Indeed, it is highly probable that it is the deposit of tuberculous matter beneath the lining membrane of these tubes which becomes the agent of their division. Ulceration of the tubes is sometimes met with in these parts; but it is by no means of an acute character, and is attended with little or no discolouration.

Concomitant
state of
bronchial
tubes.

The branches of the pulmonary artery are, for the most part, compressed and obliterated by the tubercular deposit; whence it rarely happens that the softening of this material leads to any hæmorrhage from these vessels, though it ultimately effects their division and removal. Open vessels have, notwithstanding, been traced along the irregular bridges of pulmonary structure, which are sometimes left when the tuberculous matter has been softened and evacuated; and it may be reasonably conjectured, though it cannot be proved, that the hæmophasis occasionally accompanying phthisis may have been produced by the rupture of such vessels.

Of arterial
branches.

The branches of the pulmonary veins appear, in general, to share the same fate with the arteries; but this is not

Of pulmo-
nary veins.

invariably the case, and they sometimes give rise to the rather curious appearance which I am about to describe. On opening a large tuberculous cavity, I observed several elongated papilliform projections, proceeding from different parts of the interior of the cavity. The largest might be half or two-thirds of an inch in length, and nearly the eighth of an inch in breadth: they were of a whitish colour. A careful examination, to ascertain their nature, discovered that these bodies were the divided branches of pulmonary veins, which were plugged by coagula, and covered with a soft white coating, which seemed to be a deposition from the secretion of the cavity, and was probably analogous to the friable lining of tuberculous cavities to which Laennec has given the name of a false membrane. I have since met with a similar condition of the pulmonary veins in connection with tuberculous cavities, though not to the same striking and remarkable degree.

OF A REMARKABLE BUT FREQUENT FORM OF TUBERCULOUS DEPOSIT
IN THE LUNGS, WHICH DOES NOT APPEAR TO HAVE BEEN HITHERTO
DISTINCTLY POINTED OUT.

Rounded
masses
translucent
towards the
centre, with
opaque spots
at the cir-
cumference.

It is by no means uncommon for a portion of the pulmonary texture, having a tolerably defined outline, and a rounded figure, varying in size from that of a pea to that of a walnut or even a small orange, to be infiltrated with a greyish translucent effusion, which, as I have before stated, I cannot help regarding as an early stage of tuberculous matter, by which it is rendered completely solid. Almost at the circumference of the mass so formed, we generally find a multitude of small opaque whitish points, similar to those which you see in the centre of miliary tubercles, passing into a state of crudity; and so thickly placed together, that, in whatever direction the section is made through the indurated portion, it exhibits a dotted whitish margin, so as almost to suggest the idea of chalcedony set in small pearls. There are many slight differences in the appear-

ance of these masses, which seem to depend on the period of their existence, and the mode of their formation. In the translucent grey centre we may frequently observe a few small whitish points, less than those which constitute the margin. When these become larger and more numerous, and unite, we have a rounded mass of opaque tuberculous matter; and ultimately, when they soften, a tuberculous cavity of the same size. Sometimes, though much more rarely, the opaque points forming the margin advance so rapidly, that they are completely softened down before the central part has even acquired a general opacity; and it consequently becomes detached, as a solid slough. I have not seen this take place in more than two or three instances; yet we may not unfrequently see an approach to it. This form of tubercle appears to me to be particularly interesting, as throwing considerable light on the stages through which tuberculous matter may pass, and exhibiting the analogy which they bear to some other transformations. Though Andral denies the existence of a translucent first stage of tuberculous matter, he nevertheless admits, that there are some instances, especially in the lung, in which a translucent solid deposit is pre-existent to tuberculous matter. In the cases before us, this admission would, I believe, be unhesitatingly granted. In the cases in which Andral acknowledges the pre-existence of the translucent deposits, he nevertheless dissents from Laennec as to the transformation of the one substance into the other; but rather maintains that the opaque white matter is altogether a new deposit, originally white and opaque, in which state it is secreted by the grey. It is difficult to dissent from so practised and careful an observer, whose opinions are justly entitled to great weight, or to dispute a theory which appears so plausible, and is, moreover, so well adapted to explain the phænomena which come before us: yet I confess that the opinion of Laennec (which is that of a no less practised and accurate observer) has equal claims to our

The centre
sometimes
detached.

Inference
from these
appearances.

respect and adoption, and is, at least, as accordant with analogy as that of Andral. In the case of the collections of tuberculous deposit of which I am now speaking, it seems almost as evident as any thing can be made, which is necessarily restricted to a single rather than susceptible of successive observations, that those masses in which the opaque circumferential spots alone exist are at a stage antecedent to that in which, besides the opaque points at the circumference, points of a similar character are found in the central mass. Now it is pretty evident, that the marginal opaque points not only limit the size of the central portion, but tend to cut off its connection with the surrounding living structure; and make it alike improbable that the new deposit should be added to the old one, and that the latter should be absorbed to make way for the former. If, on the other hand, we admit the possibility of the grey translucent substance being converted into an opaque whitish one, we have no difficulty of this kind, and have the sanction of similar changes which take place out of as well as in the body. Very slight alterations of composition or arrangement are sufficient to produce such a change. I might adduce the change from transparency to opacity which many crystals exhibit on the loss of a very small quantity of their water of crystallization. This example, however, is not so striking as the following. It is well known, that a strong solution of soap, however white and opaque that soap may be, is often translucent, if not transparent throughout; and in this firm translucent jelly, when it has been kept for some time, it is not very uncommon for a few opaque points to be produced.

OF TUBERCLES COMBINED WITH A PECULIAR FORM OF EMPHYSEMA
OF THE LUNG.

There is a form of tubercle in the lungs which I have repeatedly met with, but which I do not remember to have seen described. It occurs in smallish irregular fragments;

many of which are accompanied by a cavity containing air in the form of a vesicle, and bearing no resemblance to the ordinary tubercular excavation. Instead of having somewhat thickened parietes, lined by an imperfect false membrane covered with the *débris* of the tubercle, mixed with muco-purulent secretion, the cavities of which I am now speaking have very thin parietes; and when situated near the surface of the lung, which is frequently the case, they are nearly transparent, allowing us to see the tuberculous matter, which bears a small proportion to the size of the cavity, and is still, in most instances, in a concrete form. These bullæ or vesicles accompanying tuberculous matter, whilst they occasion a singular variety of tubercle, constitute in themselves a peculiar form of emphysema of the lung; to be distinguished both from the ordinary emphysema from dilatation of the air-cells, which is mostly more or less general, although the dilatation be more remarkable in particular points; and from the interlobular emphysema, which it remains for me to describe when speaking of the cellular structure between the lobules. In the cases now under consideration, although the cavities evidently depend on dilatation of some of the air-cells, yet there does not seem to be necessarily any tendency to dilatation of the neighbouring air-cells. The dilatation appears to be essentially connected with the deposition of tuberculous matter, to which I believe it to be a sequel; since, in the same lung in which these tubercles with vesicles occur, we may find numerous other tubercles without any accompanying vesicle. The tuberculous matter in the cavity appears to be lodged there without any envelope; yet, upon careful examination, in some instances, I discovered a very thin and almost imperceptible membrane passing off from the sides of the cavity, and retaining the tuberculous matter in its situation. This membrane appears to throw a little light on the mode in which this complication of emphysema and tubercle is brought about. It would seem that tuberculous

The emphysema consecutive.

matter has been so deposited as to prevent the exit of air, although it allows its ingress: the cells placed under this influence consequently become dilated, and form a somewhat irregular cavity. This distension must, of course, in degree, compress the neighbouring pulmonary structure, and bring the tubercular matter to appear as if placed within the cavity; which, indeed, eventually becomes the case when the delicate membrane before mentioned gives way. I have met with this form of tubercle, accompanied by emphysema, both in young persons and adults. It seems to be nearly or quite unaccompanied with expectoration: such, at least, was the case in a marked instance of this kind, in which the lung was thickly pervaded with these cavities: even the cough, in this instance, was very trifling. I noticed a very peculiar kind of moaning in a child, in whom I afterwards found this state of lungs. It was nearly or quite incessant, and was marked by protracted expiration. It did not appear to indicate great suffering.

OF TUBERCULAR INFILTRATION.

Description.

This term has been employed by Laennec to distinguish a variety of tubercular deposit, in which the peculiar material, instead of being collected in defined, round, or ovoid masses of various sizes, is diffused irregularly through the pulmonary texture, without any limits of its own. It does at times assume a defined form; but this, as in the case of apoplexy of the lung from disease of the heart, is owing to the infiltration being bounded by the septa between the lobules. The tuberculous matter in this form, as well as in the miliary tubercle, appears to be situated within the air-cells; as I have already endeavoured to demonstrate is the case with the product of inflammation in pneumonia, and with effused blood in pulmonary apoplexy. In the portions of lung which it affects, it appears completely to occupy the place of the inspired air; and consequently converts the lung from being spongy, light, and crepitant, to a firm and

solid mass, which sinks in water, if separated from the more healthy neighbouring portions of the lung. Tubercular infiltration appears most frequently to take place as a sequel to the deposition of tuberculous matter, in isolated defined rounded masses: and in this respect affords another illustration of what I think may be regarded as a principle; and which I have already had occasion to advert to as such, when speaking of the diseases termed malignant; namely, that the morbid processes which are going on in a particular part, are liable to be influenced by, and become similar to, that which is going on in the immediate neighbourhood; of which, the infiltration of different textures with cerebri-form matter in the neighbourhood of fungoid tumours, and the frequent production of melanosis in the neighbourhood of the eye, may be adduced as striking examples. It is probably to the deposition of tuberculous matter in the infiltrated form around the more defined tubercles, when their softening and expectoration takes place, that we may, in many cases of consumption, attribute the rapid accession of the shortness of breath, and inability to expand the chest for the reception of the inspired air. Tubercular infiltration not unfrequently affects different portions of the lung in which tubercular deposit has previously taken place. Thus, in examining subjects the upper lobes of whose lungs are to a great degree excavated by tubercular cavities of various sizes and dates, we may find the lower lobes extensively invaded with tubercular deposit, in the infiltrated form, and of recent date. I am inclined to believe that tubercular infiltration may occur as a primary form of the deposit; where the invasion of the disease may be attributed to some definite exciting cause, instead of commencing insidiously in a highly predisposed constitution. Thus, I remember to have seen an instance of particularly well-marked and extensive tubercular infiltration in the case of a young man in whom the invasion of phthisis was distinctly referrible to exposure to wet and cold, on an occasion in which he

A sequel to the isolated form.

Illustration of the influence of neighbouring parts.

Parts liable to be affected.

Tubercular infiltration sometimes primary.

narrowly escaped drowning. I suspect, likewise, that this form of tubercular deposit is sometimes a sequel to hæmoptysis; and I think I may safely say, that it is that which is most prone to affect portions of lung which have been the subject of pneumonia.

Stages of
progress.

Laennec has described the infiltrated form of tubercular deposit as existing in two stages, as is the case with the isolated deposits: the first, of a semi-translucent or semi-transparent greyish colour, having somewhat of a gelatinous appearance: the second, marked by an opaque yellowish white colour and a firm compact consistence. After it has arrived at this stage, the infiltrated tubercular deposit has the same tendency to softening and excavation which marks the isolated form. It is most probable that tubercular infiltration does not continue in the transparent state more than a short time; since its own insusceptibility of organization and the impaired condition of the organ in which it is deposited, and also the state of the patient's constitution, generally concur to promote its becoming speedily lowered, as to its vital properties.

Proof of the
influence of
the state of
the system.

A striking proof of the altered condition of the system exhibiting itself remote from the chest occurred to my observation, in the case of a young man labouring under this disease. Prior to its commencement, he had, for about two years, if not longer, lost the use of one eye by an amaurotic affection; the transparent textures of the eye, to all appearance, retaining their perfect integrity. On the appearance of those symptoms which denote the existence of phthisis, the crystalline lens began to lose its transparency, and complete cataract was the result. This change in the crystalline, whilst it indicates the altered state of the system in a remote part, is probably the result of a change very similar to that by which the semi-transparent tuberculous matter becomes opaque, and passes into the state of crudity. Although it seems probable that the infiltrated tuberculous matter does not long remain in a state of transparency, it nevertheless

presents some variety in its characters, which may probably be referred to the longer or shorter time which it may have been deposited. Sometimes it is accompanied with clear serum, which may be expressed from it: at other times it is dense, solid, and compact, yielding no fluid on pressure: it likewise varies much in colour, being sometimes light, with considerable translucence: at other times dark, from the abundance of black pulmonary matter, when it merely presents a slight degree of translucence. Differences of this kind are, I believe, to be attributed to the state of the affected portion of lung prior to infiltration taking place.

OF THE STAGES OF CRUDITY AND SOFTENING OF INFILTRATED
TUBERCULOUS MATTER.

When the infiltrated tuberculous matter loses its translucence, and becomes opaque, I believe the change commences in several irregular scattered spots, whence it rapidly extends over the whole mass. When crudity has completely taken place, the mass is compact, with considerable firmness and density, but accompanied with a want of tenacity, and may be styled friable or short. It varies considerably in colour; which appears to depend on the previous state of the texture of the lung, as to the deposition of black pulmonary matter. Sometimes it is mottled or grey, resembling some kinds of soap or granite: at other times it is of a more unmixed dead yellowish white; in which latter state it has, both in colour and texture, suggested to me a resemblance to rather stale crumb of bread, moistened and compressed without producing its disintegration. From its peculiar shortness, it exhibits, when broken, a similar uneven surface. As this form of tubercular deposit is frequently produced towards the close of phthisis, it often happens that the patient dies before the large masses which it forms have advanced to the stage of softening. Softening, however, does not unfrequently take place, and cavities of

Consequent
cavities.

large size are sometimes the consequence; but they present a more irregular figure than the cavities produced by the softening of isolated tubercles.

OF TUBERCULOUS DEPOSITS SUCCEEDING TO PULMONARY
INFLAMMATION.

It is by no means uncommon to find, in a lung which has been the subject of rather recent pneumonia, collections of yellowish-white opaque deposits, of various forms, and very various extent. Such deposits appear to consist of crude tuberculous matter; but it must be admitted, that it is by no means easy to determine whether this is the case, or whether they are to be attributed to the non-plastic form of pneumonia, or to the change which, I have already stated, takes place in some of the intermediate forms of inflammation of the lung in which a portion affected with reddish consolidation, or hepatization, as it is called, assumes an opaque whitish colour. The distinction I believe not to be of any practical importance; yet, as an interesting point of pathological anatomy, it is right that it should be made.

Morbid appearances from which they are to be distinguished.

All the three forms do, I believe, really occur. The characteristics of the two forms of pneumonia have been sufficiently laid before you: I have therefore only at present to insist on the occurrence of this secondary deposition of tuberculous matter; on the slight difference which exists between it and the two other appearances which may be confounded with it; and on some considerations which they suggest with respect to tuberculous matter. Tuberculous infiltration succeeding to pneumonia, however nearly it may resemble the product of the least plastic form of pneumonia as to colour, is possessed of a greater degree of density and firmness: it does, upon compression, not exude from every pore of the incised surface; but, although the process of softening may have commenced, the portions which are still in a state of crudity contain a solid deposit. The distinction between the tubercular deposit which we are now consider-

ing, and some of the appearances dependent on intermediate forms of pneumonia, is more difficult; as a similarity exists, not in colour only, but also in consistence: yet we may sometimes detect in the latter case, in some parts of the affected portion, indications of the transition from a reddish to an opaque white colour. There can, I believe, be no doubt that the deposit is tubercular, when it assumes the miliary form; although, as I have already observed, the isolated portions are neither so small nor so well defined as when the formation of miliary tubercles is the original affection. When, however, the deposit in these cases has more the character of infiltration, whether limited to particular lobules or assuming any other form, we must be obliged to trust more to our power of discrimination between the two substances themselves, and to the inference which may be drawn from the presence or absence of tuberculous matter in other parts of the lungs. I am induced to believe, that when the deposition of tuberculous matter succeeds to pneumonia, it either assumes, from the first, a character of crudity, or almost immediately passes into it from the translucent form; since I cannot call to mind that I have ever seen tuberculous matter in the translucent stage, in a portion of lung presenting the characters of recent pneumonia. This appears to me to be an interesting fact connected with the formation of tuberculous matter. It also tends to confirm the view which I take, that the transition from the translucent to the opaque form depends on the loss or reduction of the vital properties of the deposit—the translucent form being less removed from the nature of plastic lymph than the opaque: it is perfectly consistent with what we might have admitted *à priori*, that a portion of lung impaired by previous disease would be less likely to produce and retain the transparent form of deposit than a lung which has hitherto been comparatively healthy.

OF TUBERCLES WHICH DO NOT UNDERGO THE PROCESS OF
SOFTENING.

Before the appearance of the admirable work of Laennec on Mediate Auscultation, it was believed, by pathologists, that, notwithstanding the untractable and hopeless character of phthisis, tubercles might be removed by absorption, without undergoing the process which, in general, tends to the formation of a cavity. The late learned Dr. Young has stated, in his elaborate work on Pulmonary Consumption, that he had himself been considered, in his youth, to be affected with phthisis. The opinion that this was the case was formed by some of the first physicians of that day. The Doctor however happily recovered; and he remarked, with respect to that event, that he believed that tubercles had been formed, but had subsequently been absorbed. Laennec, however, advocated a totally different doctrine; although he is far from cutting off all hopes of recovery from those affected with tubercular consumption. He conceives that this is only arrived at by the softening and expulsion of the tuberculous matter; upon which, as I have already stated, a cavity is formed, which may become either wholly obliterated, or very much contracted, giving rise to a characteristic and permanent puckering of the corresponding surface of the lung, not unlike that which I have described as succeeding to some forms of pneumonia. Though this is the course which I have no doubt is generally taken by pulmonary tubercles when their formation does not lead to the death of the patient, and though this opinion is pretty generally adopted, yet I believe that it may also happen, that where tubercles in the lung are neither large nor numerous, they may pass into that quiescent state in which, as I have already stated, tuberculous matter is apt to be found in those situations which do not provide a way of escape from the system. I have been led to form this opinion from having occasionally met with well-defined tubercles, of small size, of a dead white or grey colour, of a firm and

Tubercles
supposed to
be some-
times ab-
sorbed.

Laennec's
opinion op-
posed to this.

Sometimes
retained.

nearly uniform but friable texture, which, though inclosed in a sort of well-defined cyst, had not that capsule which is generally formed where the process of softening has taken place. In this state they are very liable to become loaded with earthy salts, and constitute a kind of petrification. I have met with them in different parts of the lung, but most frequently near the apex, in the neighbourhood of other tubercles in which softening and subsequent contraction of the cavity had taken place. This subject appears to be one not only of curious inquiry, but of really practical importance. It is believed by some accomplished medical men, amongst whom I may mention my excellent friend Dr. Stroud, than whom no one is more patient and accurate in his observations, or more unwilling to form a conclusion without adequate proof, that the careful use of iodine, in cases of menaced tubercular phthisis, is productive of manifest advantage. So important a fact deserves to fix our serious attention. On the one hand, I think we must not be led by cases of this kind, however satisfactory and promising, to the belief that iodine, or any other agent, can bring about the absorption of tuberculous matter, which I believe to be impossible: and, on the other hand, we must not allow this belief to induce us to reject the means of obtaining the relief which has been recommended; since the facts which I have just related prove to us, that without their removal, either by expulsion or absorption, tubercles may be deprived of their fatal tendency, provided that the system generally, and the condition of the surrounding lung in particular, be improved.

Petrified.

Supposed
influence of
iodine.

I have stated to you, that there are fortunate cases, in which tubercles, having been developed in the substance of the lung, pass through the stages of crudity and softening, and are expelled by means of a communication with the bronchial tubes; and a cavity or cavities are thus produced, which are either obliterated by contraction, or, as is more frequently the case, only partially obliterated, leaving a space

Protracted
cases.

which is occupied by cretaceous or earthy matter of various degrees of consistence; whilst the remaining portion of lung continuing to be exempt from the further production of tubercles, the individuals may be said to have been cured of phthisis: and I have gone so far, as to admit that cases may occur in which such a cure may have taken place without the expulsion of the crude tuberculous matter.

Induration
of lung about
tuberculous
cavities.

I have now to call your attention to cases of a different character; in which, though the fatal termination of phthisis is not obviated, the duration of the malady is greatly protracted, and its course interrupted by periods of improvement and partial restoration to health, which, if they do not flatter with the prospect of cure, at least allow the patient to engage, to a greater or less degree, in the duties and pleasures of life. In such cases, not only is the patient's system generally brought into a state compatible with the reduced extent of respiration, but there is also a peculiarity in the condition of the affected lung which favours the temporary suspension and chronic advance of the malady. When, after such a course—the patient having ultimately sunk—I have had an opportunity of examining the chest, I have found the lungs variously but extensively perforated by tuberculous excavations; whilst much of the remaining portion of the lung possesses an unusual degree of firmness and density, very different from the engorgement, or recent tubercular infiltration, commonly met with in the lungs of those who have been cut off by the more rapid forms of pulmonary consumption. The indurated portions more nearly approach the semi-cartilaginous character: there is also a peculiarity in the colour of the lung: it is of a mottled bluish grey, produced by the black pulmonary matter variously dispersed and intermixed with those portions of indurated lung which are either of a dead or translucent white. It bears, in fact, a strong resemblance to a portion of the lung affected with the most chronic form of grey induration produced by pneumonia. This

resemblance—which is not merely apparent, but real—may throw some light on the mode in which these protracted cases of phthisis are produced; since it seems to indicate, that there has been a complication of the deposition of a more or less plastic product of inflammation with the formation of tubercle, in the attacks to which the patient has been liable. The practical inference to be drawn from these cases seems to be, that it is important, in the intervals of the exacerbations to which phthisical patients are liable, to let the medical treatment and dietetic management be of a moderately bracing and tonic character, rather than of a lowering and depleting tendency; whilst in the attacks themselves we may seek to check and controul, rather than to subdue inflammation.

Repeated
occurrence
of slight
pneumonia.

When a lung or lobe is affected with tubercular deposit to any considerable extent, it generally happens, as in pneumonia, that the corresponding portion of pleura is also affected; but whilst the pleuritis accompanying pneumonia is of an acute form, that accompanying phthisis is generally of a chronic character. Sometimes the product of inflammation is confined to the attached surface of the pleura pulmonalis, merely producing partial thickening and opacity; but it more often affects the polished surface also, giving rise to various forms of adhesion, which at times are accompanied with a good deal of adventitious deposit. The contraction which accompanies the changes which this pleuritic deposit undergoes, in conjunction with alterations in the lung from the consolidation of texture and contraction of excavations, is, I believe, the principal means which produces the alteration of form which sometimes accompanies the want of resonance at some parts of the chest in phthisical patients.

State of the
pleura in
conjunction
with tubercles.

These pleuritic adhesions, of greater or less firmness, accompanying tubercles in the lungs may be regarded as one of the causes which tend to prevent softened tubercles from opening a way into the cavity of the pleura: and I think it by no means impossible, that the thick and con-

tracted adhesions may have some effect on the deposition of tuberculous matter, similar to that which more recent pleuritis exerts upon acute inflammation of the lung.

Van der Kolk's idea respecting pleuritic adhesions in phthisis.

A curious and remarkable effect has been ascribed to these pleuritic adhesions in phthisis by a distinguished Dutch pathologist, Schröder Van der Kolk. Having but recently become acquainted with his views, I have had no opportunity of verifying them, and therefore state them merely upon his authority. When these pleuritic adhesions become permanent and organized, they form a communication between the vessels of the lungs and those of the parietes. Now, according to Van der Kolk, these communications form an important channel for the blood, obstructed in its ordinary course through the lungs; and the blood from the pulmonary artery, being poured into the circulation in the parietes, finds its way of return to the right side of the heart by means of the intercostal veins. I confess I am inclined to doubt the fact, that blood from the pulmonary arteries finds its way by the course just described, in a quantity sufficiently large to produce any material influence upon the circulation. The vascular communications, produced by the pleuritic adhesions referred to, are in some respects analogous to those which are occasionally formed between the placenta and the uterus; which, I believe, have never been shewn to exert any important influence on the fœtal circulation.

In phthisical subjects, we occasionally find small tubercles both on the attached surface of the pleura and in the false membranes on the upper surface, and possibly in the substance of the pleura itself.

I believe that I have now pointed out the principal varieties of the appearances presented to our view by tubercular deposit in the lungs. I may, indeed, have appeared prolix and needlessly minute; but I trust that this fault will be venial in the eyes of those who have either witnessed the ravages of tubercular phthisis, or are

desirous of becoming acquainted with the minutiae of pathological anatomy; in which it will be found, that facts in themselves apparently trivial become the means of unfolding or illustrating principle. Although it is my object to lay before you the morbid anatomy of the lung in connection with phthisis, rather than to offer you a picture and description of the disease itself, yet there are still some points connected with the subject which seem to fall within my province.

First—We may observe, in most patients who have been cut off by tubercular phthisis, that there is conclusive evidence, in the appearance of the lungs and the tubercular deposit, that successive crops or depositions of this material had taken place.

Remarks
respecting
phthisis.

Secondly—When death has taken place from other causes, we may sometimes detect unequivocal traces that at least one crop of tubercles had been deposited, and that their appearance is such as to indicate that a very long period had elapsed without any subsequent desposit having been produced: hence the obvious importance of distinguishing, in a phthisical subject, the symptoms and circumstances connected with the intermissions of tubercular production; and also the encouragement to persevere in our endeavours to protract this period, with the hope of ultimate success. I must refer you to the excellent work of Dr. (Sir James) Clark, for most important instructions respecting the mode of directing these efforts, as well as for much valuable information with regard to the symptoms and progress of the disease.

A Third point, which I consider to be of far greater importance than is generally attributed to it, is the part of the lung which most frequently becomes the subject of tubercular deposit. This is, unquestionably, near the apex of the upper lobe. When the disease is partial, it is almost invariably in this part that we detect it. When the disease has become general, and tubercular productions are to be

Fatal influence of a vicious mode of dress.

found in every part of the lung, it is at the summit of one or both lungs that we find the unequivocal evidence that it was there the first tubercles existed—that it was there that the unarrestable disease had made its first attack. The almost universal commencement of phthisis at this part indicates that there must be some general and important cause for this remarkable local predisposition; and I confess I cannot help attributing it to the deficient or imperfect protection afforded to this part of the chest—a deficiency which forms the striking peculiarity, or, I may say, the fatal vice, in the prevailing mode of dress adopted by females of the present day. It appears that the left lobe is somewhat more liable to the invasion of the disease than the right. The cause of this is by no means evident. The fact, perhaps, may be regarded as one of the evidences that the organs of the left side of the body are generally somewhat weaker, and in other respects rather inferior to those of the right.

Fourthly—It almost invariably happens, that those who are sinking under tubercular phthisis have, towards the close of the complaint, if not at an earlier period of its existence, to labour under some derangement of another part of the body besides the lungs. Sometimes the cough is aggravated, and the voice perverted or lost from disease in the larynx and trachea: sometimes the patient is harassed and worn down by profuse and obstinate diarrhœa: sometimes the function of digestion is impaired by derangements of the liver. Moreover, it frequently happens, that, in conjunction with tubercular deposit in the lungs, deposits of the same character take place in several other organs of the body, though by no means with the same frequency in all.

Complications of phthisis.

The comparative frequency of these complications of phthisis, and many other interesting points connected with this fatal disease, have been carefully investigated and pointed out by Professor Louis, who has applied to this subject that statistical method of inquiry which he has contributed so

much to improve and bring into notice. Let me, therefore, strongly recommend to your attention his admirable "*Recherches Anatomico-pathologiques sur la Phthisie.*" At the same time, I must remark, that researches of this statistical character require for their perfection, not merely the fidelity and accuracy and indefatigable perseverance which Louis has exhibited, and which has led him very properly to note, with equal minuteness, slight and severe derangements, and negative as well as positive facts; but they also require that extensive multiplication of equally accurate observations, which nothing short of the combined labours of numerous individuals, differently circumstanced as to time and place, can produce. The conclusions of Louis, though perfectly sanctioned within the range of his own observation, may be decidedly opposed by the facts which present themselves elsewhere. In confirmation of this remark, I may adduce the coincidence of fat liver with phthisis—a coincidence on which Louis strongly insists, having met with it in one third of his cases of phthisis. On the other hand, within the range of my own observation in this country, this concurrence of phthisis and fat liver has been extremely rare. Let it not be supposed that this discrepance has been occasioned by my mistaking or overlooking the condition of the liver to which Louis refers. I was fully aware of its appearance and character, from having myself had my attention called to it in Paris, where its frequency is unquestionable. In this country, on the contrary, it is certainly rare. I had long been looking out for an instance of it in phthisical patients and others, before I met with a single instance; and this did not occur in a phthisical patient, but in one who had spent some time abroad. I have since met with a very few instances, and some of these have occurred in phthisical patients. I may further observe, that in many other phthisical subjects I have found the liver of a light yellowish colour, resembling that which really fat livers are apt to present; but when carefully subjected to the test of heat,

Fat liver.

it has been proved not to have undergone this degeneration. I do not hence infer that Professor Louis has fallen into any mistake with respect to the existence of fat liver, in his cases. On the contrary, it confirms, in my mind, the accuracy of his observations, as to the frequency of derangement of the liver in conjunction with phthisis, as well as the importance of the remark which I have thought it needful to offer, as to the difference of results to be obtained in different situations. In the case before us, I believe that a satisfactory explanation might be offered; but as the derangements of the liver do not belong to this part of the course, I must reserve my observations on this subject for another occasion.

For the following Tabular and Statistical View of Morbid Appearances observed in Phthisical Subjects—composed from data furnished in the elaborate work of Louis—I am indebted to my much-valued friend, and able successor at Guy's Hospital, T. W. King:—

Of 1960 cases under treatment, 358 died, or rather more than $\frac{2}{11}$.
 Of the fatal cases 127 phthisical; more than $\frac{1}{3}$.
 Besides whom 40 presented some pulmonary tubercles.

Phthisis more frequent in females than in males, in the proportion of 92 to 70; but pneumonia, bronchitis, and pleuritis, more common in males—3 to 1.

Phthisis more rapid in females than in males, from an equal number of cases; 42 of the former, to 30 of the latter, being carried off in the first year.

In most cases, both lungs were affected.

The tubercles almost always most advanced in the upper lobes; and in about $\frac{1}{3}$ of the cases, they were confined to them.

The left lung solely or chiefly affected; viz. 28 cases to 10, similarly affected on the right side.

The following Table will shew the comparative Frequency of Phthisis at different ages, in the Cases recorded by Bayle and Louis:

LOUIS.		BAYLE.	
From 15 to 20	died 11	From 15 to 20	died 10
.. 20 .. 30	.. 39	.. 20 .. 30	.. 23
.. 30 .. 40	.. 33	.. 30 .. 40	.. 23
.. 40 .. 50	.. 23	.. 40 .. 50	.. 21
.. 50 .. 60	.. 12	.. 50 .. 60	.. 15
.. 60 .. 70	.. 5	.. 60 .. 70	.. 8
<hr/> 123		<hr/> 100	

The comparative duration may be judged of by the following results:—

Period of malady.		Proportion of deaths.	
From 1st month to 6th	.. upwards of $\frac{1}{5}$.		
.. 6th .. 12th	.. just .. $\frac{2}{5}$.		
.. 12th .. 24th	.. less than $\frac{1}{4}$.		
.. 2d year less than $\frac{1}{5}$.		

The age of the patient did not appear to affect the rapidity of the disorder, except in the most acute cases.

With one exception, in all the 358* fatal cases, if tubercles existed any where, they were found in the lungs; and the tuberculous matter always appeared to be furthest advanced in these organs.

In the phthisical subjects, tuberculous matter was found in other organs besides the lungs, in the following ratios:—

In the small intestines, in $\frac{1}{3}$ of the cases, *nearly*.

.. . . . large ditto	.. $\frac{1}{9}$
.. . . . mesenteric glands,	$\frac{1}{4}$
.. . . . cervical	$\frac{1}{10}$
.. . . . lumbar	$\frac{1}{12}$
.. . . . prostate	$\frac{1}{13}$
.. . . . spleen	$\frac{1}{14}$ or $\frac{1}{16}$
.. . . . ovaries	$\frac{1}{20}$
.. . . . kidneys	$\frac{1}{40}$

* All these cases were above 15 years of age.

M. Lombard, "Essai sur les Tubercules," found in 100 phthisical infants,

Affection of the bronchial glands,	87 times.
.. . . . lungs	73 .. .
.. . . . one lung	30 .. .
.. . . . the left	13 .. .
.. . . . right	17 .. .
.. . . . mesenteric glands,	31 .. .
.. . . . kidneys	11 .. .
.. . . . bowels	9 .. .
.. . . . brain	9 .. .
.. . . . cervical glands	7 .. .

In the vasa deferentia, uterus, ureters, supra-renal capsules, cerebrum, cerebellum, and medulla oblongata, each once only.

COMPLICATIONS AFFECTING THE AIR-TUBE.

Out of 102 phthisical subjects, Louis found

The epiglottis ulcerated (mostly posteriorly) in 18, or in $\frac{1}{6}$.

. . larynx ulcerated in 23.

. . trachea ulcerated (mostly posteriorly) in 31.

. . acute final pneumonia in $\frac{1}{10}$.

The bronchi were widened, thickened or reddened, or presented small ulcers very frequently, when leading from excavations. The Professor regards bronchitis as always produced when pulmonary tubercles soften. Pleuritic adhesions were nearly as constant as the bronchial affection; and he finds an uniform proportion between these two affections and the tubercular disease.

COMPLICATIONS AFFECTING THE ALIMENTARY CANAL &c.

The pharynx and œsophagus were sometimes found ulcerated; but not in any other affection, except severe fevers.

The œsophagus was sometimes found thin and soft towards the stomach*.

Of 96 stomachs of phthisical subjects, $\frac{1}{3}$ were healthy.

The stomach was distended and stretched downwards in $\frac{1}{12}$; but only twice in other cases (a proportion exceeding that observed in other chronic diseases).

. softened, thinned, reddened, thickened or contracted, in $\frac{3}{4}$.

. ulcerated in 2 cases.

The duodenum was ulcerated in 3 cases: follicles enlarged in some instances.

In the small intestines, the patches of aggregate glands were ulcerated in $\frac{5}{8}$ of the phthisical subjects: (such ulceration was almost, or quite, confined to fever and phthisis.)

. the mucous membrane sometimes reddened; rarely softened or thickened.

In the large intestines, ulceration a little less frequent, but more extensive, than in the small.

. tuberculous granulations less frequent than in the small, and confined to cases of phthisis.

. softening of the mucous membrane in $\frac{3}{4}$ of the cases.

* Louis seems to make a confusion of softening and spontaneous digestion in relation to the left end of the stomach. Guy's Museum presents specimens of the œsophagus thus perforated, and of the pleura pulmonalis dissolved. Sir A. Cooper has observed bread and cheese thus conveyed into the pleura.

The mesenteric glands tuberculous in $\frac{1}{4}$, mostly towards the cæcum. In all these cases there also existed ulceration of the bowels, but in various degrees. Ulcers often occurred without tuberculous glands.

The peritoneum in 4 cases recently inflamed.

. 1 . . . presented semitransparent miliary tubercles.
 1 . . . mesentery and omentum much thickened and tuberculous.

From 1 to 6 pints of serum in the peritoneum in $\frac{1}{4}$ of the cases.

OF THE ACCESSORY ORGANS.

The liver was fatty in $\frac{1}{3}$ of the cases.—In only 2, out of 200, not phthisical.
 9 females to 2 males.

The gall-bladder was thickened, ulcerated, or contained calculi in some cases. The spleen was altered in consistence, size &c. in many cases.

COMPLICATIONS IN THE HEART AND VASCULAR SYSTEM.

The heart was generally reduced in size;—enlarged in 3 subjects, chiefly on the left side;—often softened.

The aorta red internally in $\frac{1}{4}$;—almost always so in young subjects.

. . . . more frequently contracted than in acute diseases, but less than in cancerous.

CONCOMITANT STATE OF THE BRAIN.

Brain universally softened in $\frac{1}{20}$ of the cases.

. . . partially $\frac{1}{20}$

Serum in the lateral ventricles in $\frac{3}{4}$, to the amount of one to three tea-spoonfuls.

Pia mater infiltrated with serum in $\frac{3}{4}$.

Of the preceding complications, Louis regards—

All tuberculous deposits, ulcerated air-tube and bowels, and fatty liver, as *proper to phthisis*.

Peripneumonia, pleuritis (acute), softening of the mucous membrane of the stomach and bowels, peritonitis, arachnitis, and softening of the brain, as merely accidental.

LECTURE XVII.

ON THE MUCOUS MEMBRANES.

THE CELLULAR STRUCTURE UNITING THE LOBULES—THE VESSELS
AND NERVES OF THE LUNGS—ADVENTITIOUS PRODUCTIONS—SEAT
UNCERTAIN—ACCIDENTAL INJURIES.

OF THE SEPTA BETWEEN THE LOBULES—THEIR CHARACTER—CONNECTIONS—
INTERLOBULAR EMPHYSEMA—PRODUCED BY MECHANICAL CAUSES—CONVULSIONS
AND HYDROPHOBIC PAROXYSMS—PARTURITION—INFLAMMATION OF THIS STRUC-
TURE—PLASTIC—CHRONIC THICKENING—NON-PLASTIC—DR. STOKES'S CASE—
TUBERCLES IN THE SEPTA—CANCEROUS AFFECTION—PULMONARY ARTERY—
SMALL—ANOMALIES OF ORIGIN—WANTING—BRANCHES OF PULMONARY
ARTERY WASTED—OBSTRUCTED—PERFORATED—EXEMPT FROM OSSIFICATION—
PULMONARY VEINS—RESIST DISEASE MORE THAN THE ARTERIES—CONTAINING
HYDATIDS—ANDRAL'S CASE—ABSORBENTS OF LUNG—ANOMALIES OF TERMINA-
TION—FILLED WITH PURIFORM OR TUBERCULOUS MATTER—CASES FROM ANDRAL
—BRONCHIAL ABSORBENT GLANDS—NERVES OF THE LUNGS—MORBID APPEAR-
ANCES IN THE LUNG BUT OF UNCERTAIN SEAT—SEROUS CYSTS SIMPLE AND
COMPOUND—SCIRRHOUS TUMOURS—FUNGOID DISEASE—CASE IN ST. THOMAS'S
HOSPITAL—GUM CANCER—MELANQISIS—NOT TO BE CONFOUNDED WITH BLACK
PULMONARY MATTER OR INSPIRED CARBONACEOUS MATTER—SMALL BLACK
TUBERCLES OF DOUBTFUL NATURE—HYDATIDS IN THE LUNGS—PROBABLY SEATED
IN THE CELLULAR TISSUE—ACEPHALOCYSTS THE MOST COMMON—CYSTICERCI—
ECHINOCOCCUS—SYMPTOMS OF HYDATIDS IN THE LUNGS—OF OTHER PARASITICAL
ANIMALS IN THE LUNG—CALCULOUS CONCRETIONS—CONCRETIONS ATTRIBUTED
TO INSPIRED PARTICLES—GRINDER'S ROT—ACCIDENTAL INJURIES—CASE.

GENTLEMEN—

THE cellular structure, by which the lobules of the lungs are united, occupies, in its natural state, so small a space, that
 Its character. the lobuli appear to be in close contact; with scarcely a perceptible line of demarcation between them. From its appearance in this state, it might be supposed that the bond of union was a condensed structure, like that by which the acini of the liver are united: yet, under the influence of some of the derangements to which it is liable, its cellular character becomes sufficiently evident. It appears to com-
 Connections. municate with the more abundant cellular membrane surrounding the principal divisions of the bronchial tubes, and

the large vessels at the root of the lung ; by which latter it also communicates with the cellular structure at the base of the heart and origins of the large vessels. We have already seen, that the degree of laxity which this structure naturally possesses is sometimes rendered evident by the altered state of the lobuli which it unites ; and that in the most plastic form of lobular pneumonia, as it occurs in the lungs of children, a slight degree of motion is admitted between the lobules, something like what would take place in a slice of pancreas. Of the deficiency or redundancy of this texture, I can say nothing. The first morbid appearance observable in it, to which I shall call your attention, exhibits its cellular structure in the most striking point of view—I mean, emphysema. It is generally called ‘interlobular emphysema of the lung,’ to distinguish it from that state which depends on the general dilatation of the air-cells. It will also distinguish it from that form of partial emphysema which I have described to you as occasionally accompanying some forms of tubercular deposit. When the interlobular cellular membrane has become the seat of emphysema, the lobules, instead of being distinguished from each other by a fine line, are thrown asunder from one-sixth to one-tenth, or even to one-eighth of an inch ; producing an appearance of fissures running in straight lines, and meeting and intersecting each other nearly at right angles ; and bearing some resemblance, though on a much smaller scale, to the veins of carbonate of lime, which intersect the masses of lias which are found in the London clay, and which are known by the names of septaria, and ludus Helmontii. This form of emphysema I believe always to originate in some mechanical lesion, by which the air is allowed to escape from the bronchial tubes, or the spongy texture in which they terminate. In the cases which have come under my own observation, this lesion has been referrible to violent convulsive or spasmodic action. One well-marked case occurred in the lungs of a child

Interlobular
emphysema.

Produced by
mechanical
causes.

who died from hydrocephalus attended with convulsions. I have likewise met with it once, or oftener, in the lungs of patients who had died from hydrophobia. Were the separation of the lobules, by the emphysematous state of the cellular membrane between them, to become very considerable, there is little doubt that a suffocating degree of dyspnœa might be the consequence; but I am not aware of any case in which a state approaching asphyxia was the consequence. I have no idea that it is a fatal affection in the extent to which it is most frequently met with. In fact, I am inclined to believe that it not very unfrequently takes place, without becoming the subject of treatment, or even of observation. In the case of one hydrophobic patient, in whom it was very well marked, it was accompanied with emphysema of the cellular membrane about the neck. Emphysema, in this latter situation, sometimes takes place as the consequence of the violent and protracted throes of parturition: and I strongly suspect that this symptom, which may subside without any serious consequence, may be accompanied by, and even depend on, the form of emphysema of the lungs which we have been now considering.

The interlobular cellular membrane may become the seat of inflammation. I do not know that I have ever seen an instance of the plastic form of this inflammation in a recent state; but as we often find the interlobular septa somewhat thickened and indurated, there seems to be sufficient evidence that this condition sometimes exists.

I have been particularly struck with this thickening and induration in those parts of the lung which have been the seat of pneumonia of the plastic or intermediate forms. These thickened septa may not unfrequently be seen extending from the indurated spot into the surrounding and more healthy lung; but they gradually pass into their normal state, as they proceed from the part of the lung which had been most affected. This condition of the septa between

Convulsions,
and hydro-
phobic par-
oxysms.

Parturition.

Inflamma-
tion.

the lobules seems to bear some analogy to the altered state of the substance by which the acini or glandules of the liver are united, which we frequently find in chronic diseases of that viscus. This intervening substance becomes greatly increased in thickness, visibility, and firmness; whilst the acini are rendered dense, and, unless discoloured by bile, unusually pale. They are likewise much reduced in size; and generally assume a distinct, well-defined, and more or less rounded figure; the result, as I apprehend, of the contraction, and consequent pressure of the altered intervening substance*. It is worthy of remark, that the recent and acute affection of this structure, like that of the septa between the lobules of the lungs, seldom gives rise to morbid appearances which arrest our attention. With the exception of differences in the degree of visible vascularity, which may as often be ascribed to congestion as to inflammation, and some appearances connected with malignant disease, I cannot call to mind having seen any other derangements of this structure than the thickening and induration to which I am here alluding. Hence I am inclined to believe, that in the septa between the pulmonary lobules, in the *intervening substance* of the liver, and perhaps in some other analogous situations, chronic disease may exist in the cellular membrane, investing organs, or parts of organs, previously inflamed, and, by a slow and insidious process, induce the greatly altered condition which ultimately fixes our attention.

Of the non-plastic or suppurative form of inflammation of this structure, repeated, though not numerous, instances have occurred to my observation. On cutting into a lung in which this state of the interlobular cellular structure exists, a narrow line, of a light yellow puriform appearance, is liable to suggest the idea that a bronchial ramification filled with puriform secretion, or a vein affected with

Non-plastic
form.

* See the remarks on this subject, in the published Catalogue of the Museum of Guy's Hospital.

phlebitis, has been opened longitudinally; but a little further inspection will convince us, that, instead of a vessel or canal having been opened longitudinally, a thin layer of cellular membrane infiltrated with pus has been transversely divided; and further incisions will generally discover a similar state in other interlobular septa. Sometimes the affection is nearly or quite general throughout the interlobular septa of a lung or lobe; in which case, the nature of the affection must be at once apparent. In one case of this description, there was likewise a copious serous infiltration in the spongy texture of the lung. To this state I have already alluded, and expressed my belief that it is to be regarded as an inflammatory œdema of the lung. I am not prepared to say that this combination always co-exists with suppuration of the interlobular cellular membrane; but I suspect that such a combination is very likely to occur.

[Whilst these Lectures have been in the press, I have become acquainted with the valuable work of Dr. Stokes: from which I extract the following Case, as the most remarkable instance of the peculiar affection now under consideration, which has as yet come to my knowledge. By the author it is associated with another case; with which I must observe that it is unconnected, in the classification which I am here employing.

Case related by Dr. Stokes.

“A young man entered the Meath Hospital on the 13th of April 1832, labouring under the usual symptoms of acute pneumonia, which were of three days' standing: the disease was found to occupy the lower lobe of the left lung, which had passed into the stage of hepatization. We employed general and local bleeding, and put him on the use of free doses of calomel and opium. The blood drawn did not present any inflammatory appearance; and although his general symptoms seemed alleviated, yet the stethoscope did not shew any improvement in the appearance of the lung. In the course of the third day of his treatment, a violent exacerbation took place: subsequently to which, a moist *crepitus* was heard, mixed with the bronchial respiration over the dull portion, and the right lung became affected with a general bronchitis. These circumstances, combined with the fact that no

ptyalism whatever had occurred, induced me, after two days, to make the diagnosis of the third stage of pneumonia. About this time, a remarkable change took place in the stethoscopic phenomena. A large *râle* was heard about the root of the lung; and the bronchial respiration here became so peculiarly modified, that, even after repeated examinations, I declared to the class, that I could not satisfy myself of its exact nature, and therefore could not say whether or not an abscess had formed: the dulness continued. On the seventh day, copious sweatings, preceded by rigors, supervened: these continued till the twelfth day of his admission, when he sank.

“On dissection, we found the bronchial mucous membrane universally inflamed; and recent adhesions of the pleura, particularly on the left side. On removing the left lung, its upper lobe was found crepitating, though engorged; but the lower, when viewed externally, represented a bag of matter, the yellow colour of which was seen plainly through the pulmonary pleura. This being opened, displayed the substance of the lower lobe completely dissected from its pleura by the suppurative inflammation of the sub-serous cellular membrane. This process was also found to have invaded extensively the inter-lobular and inter-vesicular cellular tissue, so as to cause this part of the lung to represent nearly the structure of a bunch of grapes. All these nearly isolated lobules were surrounded by puriform matter, in which they hung from their bronchial pedicles. There was no air in the cavity thus formed within the pleura, yet external to the lung; nor could I find any evidence of any bronchial communication with it.”]

I have sometimes met with very small tubercles at or near the angles formed by the meeting of interlobular septa, which, I believe, must have been situated in the structure with which we are now engaged; but I am not aware of any circumstances tending to shew that those important tubercles on which phthisis depends ever commence in this situation*.

Tubercles in the interlobular septa.

* Andral has alluded, in his first chapter on Phthisis, to a Case, in which “each affected lobule was exactly circumscribed by the interlobular cellular tissue, which was thicker and more apparent than ordinary, but

Cancerous
affection of
this tissue.

In one instance, in which I found the interlobular septa near the apex of one lung very considerably thickened and indurated by a deposit of a whitish colour and firm consistence, I strongly suspected some form of cancerous infiltration to have been the cause; as it occurred in a man who had malignant tumours in the axilla, and above the clavicle on the same side.

OF THE DERANGEMENTS OF THE VESSELS AND NERVES OF THE LUNGS.

Pulmonary
artery small.

The vessels and nerves which enter into the composition of the substance of the lung are seldom, if ever, the seat of morbid alterations. When they are deranged, it is generally the consequence of disease, or injury of the structure in which they are lodged. The anomalies or derangements which affect the large vessels seem rather to belong to that part of the course in which we shall have to speak of the vascular system, than to the pulmonary texture on which we are now engaged. Yet even these deviations from the normal state cannot be without an influence on the lungs, which requires to be noticed. Thus, when the pulmonary artery is of extremely small size, its branches must also participate in this deficiency; and the consequent defective supply of blood to the organ must not merely

but exempt from all appearance of tubercles." He proceeds to state, that "at other times, on the contrary, the spaces usually occupied by this same cellular tissue are partly filled with a whitish matter, which does not lay hold on the lobules; and which, by reason of the nature of the tissue occupied by it, constitutes a track of concrete pus around the lobules which have remained sound. It may also be laid down as a general principle, that when the latter are diseased, the cellular tissue surrounding and isolating them is equally affected: this cellular tissue is then for each lobule what the pleura is for the entire lung. The most frequent of these alterations of the interlobular cellular tissue consists in a reddish infiltration, such as exists in certain commencing phlegmons: in the midst of this infiltration, we have observed tubercles in the form of very small isolated white points."—See Dr. Spillan's Translation of the last Edition.

interfere with the function of respiration, but in some degree modify the appearance of the pulmonary texture. This derangement must be still more considerable when the blood sent to the lungs is not merely deficient from the smallness of the artery, but differs in quality in consequence of the unusual source from which it is derived. This may occur in two ways: First, when a deficiency in the septum of the ventricles will allow both arterial and venous blood to enter a small pulmonary artery. This anomaly I have seen in more than one instance of blue disease: other instances are referred to by Otto. Secondly, the pulmonary artery being deficient, the lungs have received their blood solely from the aorta: a case of this kind is also referred to by Otto. The arterial ramifications in the substance of the lung are liable to a considerable diminution in size, independently of any peculiarity in the vessels from which they arise, in conjunction with emphysema of the lungs, from general dilatation of the air-cells. I have already repeatedly adverted to the exsanguine condition of such lungs*. I have in my last Lecture noticed the obliteration of the branches of the pulmonary arteries by the formation of tubercles and excavations caused by their softening. Their contraction and obliteration also take place in those portions of lung which become consolidated and contracted, as the result of pneumonia, pulmonary apoplexy, and the compression of copious pleuritic effusion. In comparatively rare cases, they are perforated by the ulceration accompanying the softening of tubercles. The same likewise take place from the softening of malignant tumours developed

Anomalies in its origin.

Wanting.

Branches of the pulmonary artery absorbed in emphysema of the lung.

Obliteration in phthisis, and in parts indurated by pneumonia &c.

Perforated by ulceration, by the softening of malignant growths, &c.

* As this Lecture was going to press, I received from my friend Dr. Lombard, of Geneva, a copy of his Memoir on Emphysema of the Lung. I regret that it did not come into my hands before I had passed from that subject. As I propose stating, in the Appended Notes, the Doctor's anatomical description of this affection, I need merely observe, at this place, that he confirms the observation which I have made respecting the diminution of the pulmonary vessels, and that he advances the opinion that their diminution and obliteration is the first step in the production

Pulmonary
arteries not
liable to os-
sification.

Veins ex-
posed by the
softening
of adjacent
structures.

Containing
hydatids.

Andral's
Case.

in the lung—from the extension of such disease from other parts, as, for example, from the œsophagus—from aneurism—and from external injury. Bichat has observed, that these vessels, like the veins which convey dark blood, are seldom, if ever, the subject of ossification. I am acquainted with but few morbid appearances belonging to the veins of the lungs. They are liable to wasting and obliteration, from the same causes as the arteries. It appears, from the fact which I have already related, in conjunction with pulmonary excavations, that their destruction sometimes takes place with less rapidity than that of the arterial branches; since they may remain, and form projections into such cavities. I have likewise seen obliterated vessels, which I regarded as veins minutely dissected out in a portion of lung, softened, and in a state of sphacelus.

Andral relates the following most remarkable case of the branches of the pulmonary veins being dilated into pouches containing acephalocyst hydatids*.

“A man about 55 years of age had been badly fed for the year previous to his entering the hospital, and had been suffering under great mental distress. During his stay in the hospital, he presented nothing but the ordinary symptoms of an affection of the heart: its pulsations were loud, but without impulsion, all along the sternum and under the clavicles: pulse natural; face swollen, and violet-coloured; infiltration of the limbs; orthopnoea; over several points of the chest, some moist bronchial *râle* was heard; and in other points, total absence of respiration: the dyspnoea, however, increased; and he died in a state of asphyxia.

“The two lungs were filled with hydatids. We thought, at first, that they were seated in the parenchyma itself; but a more careful inspec-

of the derangement. It seems most probable that the two derangements mutually promote each other. There may be differences in the mode of commencement, in different cases; and where there is an obvious mechanical cause, it seems most reasonable to suppose that the contraction and obliteration of vessels have been secondary derangements.

* See Dr. Spillan's Translation, p. 555.

tion revealed to us a fact, which has but few like it in the annals of science; viz. the existence of hydatids in the pulmonary veins. Several of these were lodged in pouches with a smooth surface, which at first seemed to be so many cysts. Others of them, empty, and rolled several times on themselves, were contained in narrow canals, the elongated form of which they assumed. The inner surface of these canals was smooth, like that of the great pouches: they ramified, like vessels. We soon ascertained that at each pouch a vessel terminated, of small calibre, which, to form it, underwent greater or less dilatation. We then dissected the pulmonary veins at their entrance into the heart, and we traced them into the lung. When we had come to their almost capillary divisions, we began to perceive several of them present a considerable number of enlargements, which were filled with hydatids. After being thus dilated, the vein assumed its original calibre: then, a little further on, it was again dilated. The largest of the pouches might have contained a large nut; and the smallest would admit a pea. They existed equally in both lungs. The hydatids which they contained had all the characters of acephalocysts: several presented small points of a dull white colour in their substance; others presented, on their inner surface, a great number of miliary granulations: most of them were burst. Around them the pulmonary tissue was, in several points, healthy and crepitating: in other parts, it was infarcted, and even hepatized.

“A vast hydatiferous cyst, with catilaginous parietes, capable of containing a large orange, was found in the liver: eight to ten acephalocysts were included within it. This is the second time we detected the simultaneous existence of hydatids in the liver and the lung.

“The right cavities of the heart were considerably dilated; and the parietes of the right ventricle a little hypertrophied.

“The presence of so great a number of hydatids in the pulmonary veins must necessarily have occasioned considerable embarrassment to the circulation. Did it contribute to the great dilatation of the right cavities of the heart?”

It is so completely at variance with all that we know of the habits of acephalocysts for them to take up their abode in any of the natural canals or cavities of the body, or, indeed, in any other structure than the cellular tissue of

organs, that I cannot help suspecting that, in this extraordinary case, minute hydatids must have found their way into the circulation from the liver. As I have stated in the Lecture on Parasitical Animals, the veins and absorbent vessels passing at the sides of cysts enclosing hydatids are liable to be opened laterally (see Vol. I. p. 187). By such openings, acephalocysts of microscopic size may possibly find their way into the blood; and be arrested in the veins, precisely as globules of mercury are said to have been, when that metal has been thrown into the absorbents.

Absorbents
of the lungs.

Anomalies of
termination

entering the
vena azygos.

Filled with
tuberculous
or puriform
matter.

But few anomalies and derangements have been observed in the absorbent vessels of the lungs. They have, however, furnished some of the rare cases in which the absorbent vessels have been seen to communicate with the veins otherwise than by the thoracic duct or right trunk. I have myself seen a lymphatic vessel from the lung entering the vena azygos. The two following Cases, quoted from Andral, afford examples of disease in these vessels. Whether the matter contained in them is to be regarded as really tuberculous or not, it seems highly probable that it was the product of the vessels themselves under disease, the evidence of which is to be found in their thickening and loss of transparency. In fact, this affection, which is strictly analogous to the distension of the lacteals in cases of ulceration of the mucous membrane of the small intestines, may be compared to phlebitis, and to disease of the veins leading from a part affected with medullary sarcoma, when these vessels are found to contain a similar secretion*.

LYMPHATIC VESSELS OF THE PERIPHERY OF THE LUNG FILLED WITH A
SUBSTANCE RESEMBLING TUBERCULOUS MATTER.

Case given
by Andral.

"A mason, 25 years of age, died of chronic pericarditis. He had had no symptom, with respect to his lungs, except a cough, which lasted for the last four months before his death. At the base of one of the lungs there existed a circumscribed sanguineous infiltration (pulmonary

* See Dr. Spillan's Translation, p. 419.

apoplexy), which occupied a space nearly equal to that which might be filled by a small apple. Quite near this sanguineous infiltration, there was found a tuberculous mass, about the size of a nut. In different points of its extent there were observed small red spots, owing, probably, to the tissue infiltrated with blood, in the midst of which the tuberculous matter seems to have been developed. From the environs of the place where the latter existed, a lymphatic vessel proceeded, which passed between the pulmonary tissue and the pleura, and ceased to be visible not far from the bronchial ganglions. This vessel was tortuous, and, in its course, presented granulations like a string of beads, of a greyish white. One would have said they were small lymphatic glands placed at intervals, as swellings in the course of the vessel. The latter having been cut into, it was ascertained that these granulations were owing to the presence of a concrete white matter, collected in clots in the interior of the lymphatic, from space to space. The parietes of this vessel likewise presented an unusual thickening, and, at the same time, a diminution of transparency. At first view, and previous to the dissection, the swellings just described, presented the greatest resemblance to small miliary tubercles. The latter also existed in great numbers in the interior of the same lung. The lung of the opposite side presented no other lesion than several traces of pulmonary apoplexy, without any tubercles."

MATTER OF A TUBERCULOUS APPEARANCE IN THE LYMPHATIC VESSELS OF THE LUNG AND OF OTHER PARTS, AS ALSO IN THE THORACIC DUCT.

"A woman affected with cancer of the uterus died in La Charité. The external surface of both lungs was traversed by a great number of white striæ, closely resembling, in their disposition, lymphatic vessels full of mercury. These numerous striæ were, in fact, vessels filled with a whitish concrete matter, of slight consistence, readily crumbling under the finger. Several of these vessels were easily followed as far as the bronchial ganglions, which were swollen, and had degenerated into a substance of a greyish-white colour, creaking under the scalpel. The interior of the lungs, and particularly of the left, also contained several of these vessels, similar to white threads, enlarged at intervals. Sometimes they were found isolated; sometimes collected together in a greater or less quantity. They represented a species of plexus, similar to those which, in certain animals, occupy

Case given
by Andral.

the place of lymphatic ganglions. In other respects—and this must not be forgotten—there was nothing found in any part of the lungs resembling tubercles. But the absorbents of the lung were not the only diseased parts of the lymphatic system. From several of the inguinal ganglions, which had degenerated like the bronchial ganglions, lymphatic vessels proceeded, distended by limpid and colourless serosity, and presenting, from space to space, white points, easily displaced by slight pressure. The matter which formed these white points seemed then to be contained only in the cavity of the vessels. In fact, a slight incision having been made in the parietes of the vessels, this matter escaped from them spontaneously, by the mere fact of the elasticity of the vessels which contained it. It presented the same characters as those of the matter contained in the vessels of the lung. Some lymphatic canals, thus distended from space to space by whitish clots, rounded into small masses, or elongated into a cylindrical form, were easily traced, under the crural arch, into the pelvis, to the middle of an enormous cancerous mass, which existed anterior to the body of the lumbar vertebræ. The thoracic duct disengaged itself from the middle of this mass just at the last dorsal vertebra. In three or four cases, this canal was very much distended, and, as it were, obstructed by the same matter which filled the lymphatics. It formed masses there, the largest of which equalled the size of a nut, and which, as in the vessels, was contained in the cavity of the duct, without having any connection whatever with its tissue.”

Bronchial
glands,

It would be rather out of place for me now to go fully into the derangements of the bronchial glands, seeing that they do not belong to the mucous membranes, and that I have not as yet offered any general remarks on these and other solid structures; nevertheless, it seems expedient for me to say something respecting them, in connection with the absorbent vessels of the lungs.

These glands, like others of the same class in different parts of the body, vary much in respect of size in different subjects; and it is extremely probable that such variations may exist, to a considerable extent, without being referrible to disease. In general, a large size of these bodies,

even when unattended with manifest change of structure, may be regarded as indicative of a tendency to strumous affection. Perhaps the most common deviation from the most healthy state of these glands is their being more or less loaded with black pulmonary matter. It is very difficult to account for the mode in which this change is brought about, and I shall not now offer any speculation with regard to it. You may recollect, that I have already touched on this question, when speaking of the blackness of animal substances. It is likewise difficult, or impossible, to determine how far this state of the bronchial glands interferes with their functions. These glands are very frequently enlarged, to a degree which must be regarded as absolutely morbid; but in many, if not in most of these cases, there likewise exists a deposition of tuberculous matter in the glandular structure. The enlargement and tuberculous affection of these bodies are much more common in children, and in persons under the age of puberty, than at a later period of life. In adults, we not unfrequently find them in a state of evidently old derangement; and such cases rather confirm, than invalidate, the preceding remark. In very young persons, tubercular disease of the bronchial glands is often greatly in advance of tubercles in the lungs; and in some cases, it exists when the lungs are quite free from tubercles. Andral is probably correct in regarding the affection of the bronchial glands as generally consequent on an inflammatory state of the mucous membrane of the bronchi; yet I am inclined to believe that these glands may themselves be primarily affected, or, that disease may be extended to them from other glands of this class in the neck. Andral says, that the tubercular degeneration of the bronchial glands is rather uncommon in phthisical adults. He gives the following results of his observations respecting the relations between the morbid state of these bodies and that of the respiratory apparatus:—1. A perceptible tuberculous degeneration of these glands, in conjunction with

loaded with
black pulmo-
nary matter,

enlarged,

tuberculous.

numerous pulmonary tubercles. 2. A similar state of them, with very few tubercles in the lungs. 3. Some tubercles in these bodies, without a trace of pulmonary phthisis.— In these last cases, he generally found marks of inflammation in the air-tubes. The bronchial glands not unfrequently acquire a large size, and very considerable induration from tuberculous deposit. The tuberculous matter sometimes softens, and leads to an ulcerated opening into the bronchi; but such cases are very rare. I cannot call to mind having seen a single instance of the kind. It generally happens, if the patient's life is prolonged, that the tuberculous deposit becomes inert, loses its watery parts, and acquires a cretaceous or calculous character. The bronchial glands, so enlarged, may press upon and contract the bronchi, and thus interfere with respiration. They may in like manner interfere with the blood-vessels; and when of stony hardness and irregular figure, give rise to aneurismal affection.

Fungoid
disease.

Fungoid disease and melanosis are also met with in the bronchial glands; and in some cases produce tumours of considerable size, by which the bronchi may be compressed, and the pulmonary structure encroached upon, as well as contaminated by extension of the disease. In consequence of the liability of these glands to become loaded with black pigment, independently of melanosis, malignant disease in them may assume the appearance of melanosis; whilst in other organs it may assume that of medullary sarcoma or cancer, and thus shew that it is unconnected with melanotic diathesis.

Melanosis.

Nerves.

Very few derangements have been recorded or observed in the nerves of the lungs; yet it can scarcely be doubted, that, like other structures, they are liable to disease, both of a primary and of a secondary character. The fatal effects produced by the division of the pneumogastric nerves are sufficient to convince us that serious disturbance of function may be produced by lesions of these nerves. Moreover, we

meet with cases of greatly disturbed respiration, in which the most careful examination can discover no disease, either in the air-passages or the substance of the lungs. Such cases have been regarded as nervous; and remedies supposed to act upon the nervous system are ordered accordingly, and not unfrequently produce the desired effect. We must not, however, conclude that all these cases depend on derangement even of a functional character of the nerves of the lungs. We know that various physical circumstances* in which an individual may be placed, and various causes existing in his own person—such as, the state of the stomach and other digestive organs—are capable of greatly modifying the extent to which the system may require the exercise of the function of respiration. There are, doubtless, other cases, with which we are imperfectly acquainted, which exert an influence of the same kind. The temporary increase of the need for respiration, arising from any of these causes, would produce dyspnœa; which, though possessing a nervous character, ought not to be ascribed to organic or functional affection of the nerves of the lungs. When dyspnœa, having apparently a nervous character, is susceptible of relief from the application of galvanism, it seems reasonable to suppose that the cause is connected with derangement of the pulmonary nerves. The most unequivocal instances of disease affecting these nerves, and of its influence in producing a morbid condition of the respiration, occur in those cases in which these nerves are implicated in morbid developments in their immediate vicinity. I quote the following very illustrative Case from Andral's "*Clinique Médicale*."

Remarks on
nervous
dyspnœa.

"A young man, 24 years of age, having for several years an engorgement of the lymphatic ganglions on both sides of the neck, unattended with pain, presented several of the rational signs of an

Case from
Andral.

* See Edwards on the Influence of Physical Agents on Life; translated by Drs. Hodgkin and Fisher.

organic affection of the heart, when he entered La Charité in the beginning of March 1826. Face puffed and livid; purple tint of the lips and *alæ nasi*; oedema of the eyelids; ascites, and very trifling infiltration of the lower extremities. The respiration was short and hurried, and performed chiefly by the action of the ribs: lying down in the horizontal posture impossible. The difficulty of breathing increased gradually, but it was principally during the last year that the dyspnoea became painful to him: it had uniformly increased, in consequence of moist rainy weather. The chest, when percussed, resounded well everywhere: auscultation detected nothing unusual in the region of the heart, nor in any other point which could lead us to suspect the existence of a disease of this organ, or of the great vessels. A mucous *râle* was heard in different parts of the chest: in other parts, a dry sibilous *râle*: in other parts again, the respiratory murmur was clear, but loud.

“*Post mortem*.—Nothing remarkable in the brain or spinal cord. Heart and vessels natural. A small number of miliary tubercles scattered through the pulmonary parenchyme; which was in general engorged, but healthy and full of air. Some old cellular adhesions united the pleura costalis and pulmonalis of the two sides. The anterior mediastinum was occupied by a large mass of tuberculous lymphatic ganglion. Through the midst of this mass the two diaphragmatic nerves passed. It was impossible to trace them through the numerous ganglions which surrounded them, and pressed them on all sides. They re-appeared not far from the diaphragm; and, from the place where they were disengaged from the ganglionic mass, to their distribution in the diaphragm, these nerves were remarkable for their greyish colour; similar to that often presented by the optic nerve which enters an eye for a long time wasted. In the abdomen, numerous tubercles were scattered over the small intestines; some small and superficial ulcerations for the extent of some inches above the ileo-cæcal valve; a tubercle, the size of a hazel-nut, in the cortical substance of one kidney; cellular adhesions between the diaphragm and liver, the tissue of which was healthy; the spleen was soft, and tolerably large; considerable effusion of serum into the peritoneum; and in fine, anteriorly to the vertebral column, an enormous mass of lymphatic ganglions were degenerated into tubercles, which forcibly compressed on the one hand the vena cava, and on the other hand

the vena portæ, surrounding all their principal branches, as well as the trunks.

“On each side of the neck, from the edge of the jaw to the clavicles, there was found a large chain of tuberculous lymphatic ganglions, like those of the thorax and abdomen. Several were interposed between the vessels and the nerves of the neck; and the carotid artery and jugular vein were found to be separated by these ganglions. With respect to the *pneumogastric nerve*, some inches below the point of origin of the superior laryngeal nerve it became lost in a mass of ganglions, in the midst of which it was impossible to find it. It reappeared a little above the level of the clavicle, and was remarkable, on both sides, for its flatness: it supplied, as usual, the recurrent nerves. The remainder of its extent, and particularly its branches, which constitute a great portion of the pulmonary plexus, presented nothing remarkable. Each axilla was occupied by a tumour the size of a large orange, which was formed of an assemblage of tuberculous lymphatic ganglions.”*

OF SOME ADVENTITIOUS PRODUCTIONS IN THE SUBSTANCE OF THE LUNG, THE PRECISE SEAT OF WHICH MUST BE REGARDED AS SOMEWHAT UNCERTAIN.

Besides those depositions in the lung to which the term ‘tubercle’ has been specially applied, other depositions, having a tubercular form, are occasionally met with, encroaching on the substance of the lung: I mean those to which the term ‘malignant’ is applied; and which, consequently, belong to that general type of formation which has been the subject of some preceding Lectures. This anatomical character would lead one to believe, *à priori*, that productions of this description, when found in the substance of the lung, cannot be formed in the same mode as that in which miliary tubercles appear to be formed; namely, by a partial infiltration into a few adjoining cellules. The appearance of these bodies themselves is likewise opposed to the idea of their having taken their origin

Malignant
tumours.

* Dr. Spillan’s Translation, p. 316.

Questions as
to their situ-
ation.

absolutely within those cavities to which the air penetrates; but it is still left for us to determine whether they are formed in the spongy texture of which the individual lobule is composed, and, consequently, in the substance of those inappreciably thin septa of which it is constituted; or whether they are not rather developed in that scanty interlobular cellular tissue with which we have been recently occupied; or in the cellular membrane which communicates with that between the lobules, and which may be regarded as accompanying the ramifications of the vessels. I have no minute observations to advance in immediate connection with this question: and as it is useless, and often productive of error, to adopt an opinion which is merely theoretical, I only throw out, as a conjecture, the idea, that it is to the last of the three situations to which I have alluded that these productions belong. At the same time, I must state the fact, that very small tubercles, which appear to belong to this class of adventitious structures, may sometimes be seen in the interlobular septa, near the surface of the lung; and that they are yet more frequently met with in the sub-serous cellular membrane of the pleura pulmonalis, with which the interlobular cellular tissue is evidently continuous. Dismissing the subject of the situation of these adventitious productions, let us now consider these bodies themselves. Cysts, having either the simple or compound serous character, and so far possessing the characters of a natural tissue as not to be called malignant, but rather coming under the same division with non-malignant ovarian dropsy, and the so-called hydatid disease of the breast, may sometimes occur in the lung; but they are by no means frequent.

Serous cysts,
simple and
compound.

Scirrhus
tumours.

Of the three forms—scirrhus, fungus, and melanosis—instances are not of a very rare occurrence in the substance of the lung. Scirrhus tubercles are, perhaps, the most frequent; but they seldom or ever exceed a very small size, scarcely equalling that of a moderate pea.

Tubercles answering this description are not uncommonly found in the lungs of those who have been affected with scirrhus disease of the mamma, though not so frequently as immediately beneath the pleura. The transformation of a considerable portion of the lung itself has been spoken of; but all that I can state respecting such a derangement of the lung, is, that I have never seen any thing of the kind myself; the only approach to it being the indurating infiltration of the interlobular cellular structure to which I have already alluded, and respecting the scirrhus character of which a doubt might be raised.

Fungoid tubercles are the malignant productions which most frequently lead to serious derangement in the substance of the lung. They have been particularly described by Laennec, under the term of encephaloid tumours. They have probably been seen by most persons who have had frequent opportunities of inspecting the dead. They are met with in conjunction with similar productions in various parts of the body; and appear but very rarely to form the primary development of the disease. It is a matter of considerable interest, and certainly meriting greater investigation than it has yet received, to determine, by multiplied observations, the parts and organs which are the most intimately united by that, at present inexplicable, sympathy, which causes one part of the system to become deranged in preference to another, when a distant organ is affected. I have noticed, notwithstanding the general rarity of fungoid disease in the lungs, several instances of its concurrence with similar disease affecting the bones. Whether there be any thing like the sympathetic connection between the two of the kind which I have hinted at, must be left to further observations to decide. The general characters of fungoid tubercles in the lungs so fully coincide with the description which I have already given of fungoid disease, in former Lectures, that it would be needless to repeat them here. They vary, from the smallest

Fungoid
tumours.

size, to that of a large orange, or even a child's head. It appears, from the description given by Laennec, that one sometimes softens and breaks down; and then, forming a communication with the bronchial tubes, gives rise to a cavity, over which pectoriloquism may be heard. Of this I have seen no instance: the patients have always been carried off by the advance of disease in other parts, before this stage was arrived at.

I have known the outer cyst of a fungoid tubercle in the lung to become the seat of an earthy deposit; by which a bony shell had been formed, which would, of course, necessarily interfere with the expectoration of fungoid matter, were softening to take place.

Case in St.
Thomas's
Hospital.

In an interesting case which occurred in St. Thomas's Hospital, the development of fungoid disease took place after an extensive injury from a burn. Beautifully white brain-like masses, of about the size of marbles, were found in the substance of the lung; but they were neither so large nor so numerous as those which occurred in the abdomen; where they were not only found in the liver and spleen, but about the pancreas, and along the course of the aorta, which they so compressed, as greatly to contract and distort its canal.

Gum cancer.

Malignant tumours in the lung are sometimes found approaching to that character which has been described by Laennec as gum or gelatinous cancer, the material with which the cysts are filled consisting of what appears to be very dense mucus. I do not, however, remember to have seen this character so distinctly marked in the lung as in some other situations, but it has rather exhibited an intermediate form between the best specimens of gelatinous cancer and fungoid disease. In two cases, this form of malignant disease in the lung concurred with osteosarcomatous tumours, exhibiting the same character.

I do not remember to have seen or read of cirrhosis of the lungs.

Melanosis sometimes, though rarely, affects the lungs. Melanosis.
 It occurs in the form of nodulous tumours, of various sizes; and it appears that the neighbouring pulmonary structure is liable to be infiltrated with a material similar to that of which the melanotic tubercles are composed. The enclosing cysts in this affection may be so extremely thin and obscure, as to escape observation; which appears to have led Laennec and some others to admit an unencysted form of melanosis. Laennec has noticed some cases in which the melanotic matter in the lungs was reduced to a soft detritus, somewhat like thick ink. In treating of the subject of melanosis, I have already remarked, that we must be careful not to confound with melanosis, as a malignant disease, every instance of the abundant production of black pigment. This remark is peculiarly applicable to the presence of black matter in the lung. Without repeating that which I have already stated respecting the causes which appear to me to promote the production of this pigment, it will be proper that I should state the cases of blackness in the lung which may be confounded with melanosis.

Not to be
 confounded
 with black-
 ness from
 other causes;
 as,

First, the black pulmonary matter, which is met with, to a greater or less extent, in the lungs of almost all adults, may, from some causes which have interfered with respiration, exist to a very remarkable extent, without the texture of the lung being very much altered in conjunction with it. Sometimes this inordinate production of pigment is more partial; and evidently connected with some further derangement of the texture of the lung, rendering it more dense, and in some parts even compact and solid. The causes of such alterations I suspect to be either pulmonary apoplexy or red hepatization; but as we meet with them as the effect of an old disease, the narratives of cases as they are generally collected can throw little light on their history: in fact, it is not very likely that a patient should give such statements of past illness as to do away with this difficulty.

Black pul-
 monary
 matter.

Inspired carbonaceous matter.

Sometimes the substance of the lung is blackened by inhaled particles of carbonaceous matter; of which a striking example has been given by my late excellent friend, Dr. James Gregory, in the *Edinburgh Medical and Surgical Journal*: and the subject has been still further investigated and described in the same *Journal*, by my learned and laborious friend, Dr. W. Thompson. I suspect, however, that, in this and similar cases, the altered character of the pulmonary structure is not wholly to be ascribed to the mechanical cause, but that a morbid process has concurred with it.

Small black tubercles of doubtful nature.

It is not very uncommon to find in the substance of lung, both deeply imbedded in it and near the surface, small defined hardened black bodies, of the size of a pepper-corn, or more rarely of a pea; and surrounded, in most cases, by crepitant lung, respecting the nature of which it is not easy to pronounce with certainty. They may, in some instances, be regarded as truly melanotic; which we may either suspect or receive with tolerable certainty, by taking into consideration, not only the structure of these bodies as far as can be made out, but also the state of the patient's system generally, as exhibited by the presence or absence of melanosis or scirrhus in other parts of the body. I believe, however, that these little bodies are more often the result of some other affection, than of melanosis; such as, small pulmonary apoplexies, or partial lobular pneumonias of very old date; or it is possible that they may have been produced by small scattered tubercles retained without softening. Broussais, in fact, declared, that melanosis was nothing more than tuberculous matter coloured with black pigment. I need not take up your time in endeavouring to refute this opinion, which is inconsistent with the structure of malignant tumours; but, with reference to the instances before us, we may remark, that the inorganizable character of tuberculous matter is inconsistent with the idea of its becoming the seat of the deposition of black pigment. If, therefore, small

tubercles are in any way accessory to the production of the little black bodies in question, it is more likely that the immediately surrounding texture is the seat of the black deposit, whilst the tubercle itself is contracted within.

OF HYDATIDS IN THE LUNGS.

Vesicular worms, or true hydatids, are occasionally, though rarely, met with in the substance of the lung. The precise situation in which their development commences, is, like that of the adventitious productions of which we have just been speaking, necessarily obscure; yet probability is in favour of the cellular tissue surrounding the vessels and between the lobules. Laennec, who has paid particular attention to vesicular worms, says, that the only species that he had found in the lungs of man is that of the *acephalocystis*; but from a specimen in the Museum of this Hospital, it appears that the *cysticercus* may also invade the lungs of man. Of *cysticerci*—as I have already had occasion to observe to you, when treating on the subject of parasitical animals—there are several species or varieties, differing from each other both as to form and size. In both these respects, those of which I am now speaking, as occurring in the lungs of man, resemble the *cysticercus* so frequently met with in the liver of sheep; the caudal vesicle being about an inch in diameter, and the head and neck being about the same length. Like these, they appear singly in each particular cavity, but several of the cavities are scattered through the substance of the same lung.

Hydatids probably seated in the cellular tissue.

Acephalocysts the most common.

Cysticerci.

In another specimen, the hydatids presented a remarkable number of those opaque white elevations, which I have pointed out as occasionally occurring on the parietes of the *acephalocysts*. In the instance of which I am now speaking, the spots were particularly numerous. Similar hydatids have been described by some authors as the *echinococcus*, whilst by others they are only regarded as a variety of the *acephalocystis*. I cannot pretend to decide with certainty

Echinococcus.

Symptoms of
hydatids in
the lung.

on this obscure point in zoology, yet I confess I am rather inclined to the latter opinion. Cysts containing undoubted acephalocyst hydatids may acquire considerable size in the lung; when, as Laennec has remarked, they may produce a dull sound on percussion at that part of the chest at which they are situated. It has also been stated, that where there are more than one hydatid of this kind in the same cavity—which is by no means uncommon—a peculiar sound may be heard, which is attributed to their friction against each other. The hydatid tumour in the lung, as in other parts of the body, consists not only of the hydatids themselves, but also of an inclosing cyst or capsule, derived from the structures in which it is imbedded: this cyst not only varies in size and thickness with the size and age of the tumour, but the structure of its parietes is by no means uniform. Thus, a recently-formed capsule will merely consist of condensed cellular membrane; whilst in those tumours which are older, it becomes, to a greater or less extent, semi-cartilaginous or bony. In one case—which has furnished a specimen to our Museum—whilst a portion of the cyst, containing acephalocysts, occupied the upper part of the lung, it also extended along the root of the lung and large vessels, and occupied a considerable space between the close pericardium and the heart. The principal inconvenience which the patient suffered, and ultimately his death, were referrible to the disturbance of the heart's action; and from the appearance of the specimen, I am induced to suppose that the hydatid tumour was first formed in close connection with the heart. The case was of some months', if not of some years' standing; during which time, the patient, who was able to get about, had consulted different medical men; on which account no regular history of his case could be collected. He died very suddenly, whilst engaged in carpenter's work for his amusement.

Hydatids in the lung need not necessarily end fatally; since they may either be expelled by coughing; or, on

losing their vitality, be retained in a collapsed state, as inert foreign bodies in their contracted inclosing cyst.

I am not aware that the lungs of man are subject to any parasitical animals, besides the vesicular worms which I have now mentioned, and the rare occurrence of the *Filaria bronchialis* or *Hamularia* in the bronchial tubes. I have seen acephalocyst hydatids in the lung of a kangaroo: and *Strongyli*, and various other species, are described as occurring in the lungs of many animals, and in those of reptiles in particular. I have myself found two species in the lungs of the Python. The branchiæ of fishes, crustacea, and aquatic mollusca, are also very liable to be attacked by parasitical animals.

Other parasitical animals very rare in the lungs of man, but some are found in those of inferior animals.

Bony and calculous concretions are spoken of by pathologists as occurring in the substance of the lung; but I do not think it necessary to speak of them as a distinct affection, conceiving that they are rather to be regarded as the ultimate condition of some of the affections which I have already described, in speaking of the derangements of the lung. Thus I have already described to you calculous or bony concretions produced by retained tubercles infiltrated with earthy salts. The secretion contained in cavities from which tubercles have been expectorated may likewise become so charged with earthy materials, as to constitute either a cretaceous magma, or even a hard defined calculus. It is extremely probable that a small portion of the lung, which has lost its cellular character, or become disorganized by lobular pneumonia or partial and limited pulmonary apoplexies, may likewise ultimately become loaded with earthy matter, and constitute a bony or calculous deposit. I am not prepared to say, from personal observation, that larger portions of lung, indurated by either of the two last-mentioned causes, and converted into a dense semi-cartilaginous mass, are liable to become either generally or partially converted into bony matter; yet some

Calculous concretions.

recorded cases of ossification of the lung render it presumable that such a change has taken place. Small earthy concretions, situated near the centres of such deposits, are not uncommon; but they are to be ascribed to small portions of inorganizable matter there shut up. Other instances of bony matter discovered in the substance of the lung may be ascribed to changes in the cysts investing malignant and other adventitious structures, or inclosing vesicular worms, or other foreign bodies, lodged in the substance of the lungs.

Concretions
attributed to
inhaled particles.

An idea has been advanced, that earthy collections in the lungs are sometimes produced by the inhalation of impalpably fine dust, to which some persons are, by their occupations, exposed; and the workmen at the quarries of Montmartre have been cited as instances of this fact. Although there can be no doubt that the inhalation of the atmosphere highly charged with mineral particles, however minute, must be a highly deleterious source of irritation, and consequently be very liable to become a fruitful cause of those affections which I have mentioned, as producing calculi in the lungs; yet it appears extremely unlikely, that, under ordinary circumstances, the earthy particles should either penetrate profoundly into the substance of the lung, or be so partially collected as to form concretions. It is more probable that they would be arrested by the mucus of the air-passages, and voided by the efforts at expectoration, excited by the irritation which they induce. It would seem, however, from the report which I have heard of the fate of the Roman-cement makers at Sheerness, that when the inhaled particles have a strong tendency to unite with moisture, and rapidly set, earthy concretions may actually be formed in the bronchial tubes. The possibility of the gradual accumulation of minute particles of foreign matter, received with the inspired air, and diffused through the substance of the lung, rather than aggregated in the form of concretions, is demonstrated by the case published by

my late excellent and accomplished friend, Dr. James Crawford Gregory; in which the lungs of a coal-miner were found of a diffused inky blackness. Portions of these lungs, placed in the hands of Dr. Christison for chemical analysis, yielded coal-gas, on being subjected to destructive distillation.

The deleterious and even fatal effects of the mechanical irritation of the lungs by the inhalation of floating particles is exhibited, on a large scale, in the prevalence of what is called the ‘grinder’s rot’ among the workmen at Sheffield, and the needle-makers in Worcestershire. It appears that the fine particles of steel contribute more than those of the stone to produce this effect; since a medical friend of mine, (the late) Hall Overend, of Sheffield, discovered, that a powerful magnet, so placed as to intercept the steel-dust and divert it from the lungs of the operator, was productive of the most beneficial result.

Grinder’s
rot.

Accidental injuries to the pulmonary texture seldom present morbid appearances of any great interest; since the cuts or lacerations, of which they generally consist, are mostly complicated with other lesions, by which the patient is carried off shortly after the injury, and often before there has been time for the production of other appearances; as those which are common to acute inflammation, however produced. The effusion of blood into the substance of the lung or into the cavity of the pleura, and the admission of air to the same cavity, are amongst the most serious effects of the injuries of which I am speaking; since it is to them that the too often fatal oppression or inflammation, which supervenes, is to be attributed. On this account, it is obviously important that as little as possible should be done to the external wound, beyond merely removing extraneous bodies, if such exist in it, and excluding the air by the simplest applications: our whole attention being directed to seconding the efforts of Nature, by maintaining the most perfect rest, and by general means

Accidental
injuries.

Cases.

reducing the tendency to inflammation. Several striking and remarkable cases have fully proved, that the pulmonary texture possesses a very considerable power of repairing the injuries which it may receive from external violence. Some years ago, a lad, whilst assisting at the plough or harrow, was thrown down, and received an injury, by which the lung was not only severely wounded, but a portion, made to protrude through an opening in the chest, was so lacerated and mixed with dirt, that it could not be safely replaced. This lad ultimately recovered.—A still more remarkable instance occurred, but a few years ago, in the practice of William Maiden, of Stratford, who has given an interesting and detailed account of the case. A gentleman, whilst attending to his horse, which was in single harness, was transfixcd through the breast by one of the shafts, in consequence of the horse suddenly plunging forwards. This he did with so much violence, that the shaft penetrated on one side of the sternum, and came out at the other; and then, perforating the boards or door of an outhouse, pinned the gentleman in that position, until assistance could be obtained. Though immediate death seemed inevitable, this gentleman survived some years. A most precarious and tedious illness followed the injury; but the skill and assiduity of William Maiden were ultimately rewarded by the patient's recovery. This gentleman died some years after; when—an inspection being allowed—it was discovered that the lungs on each side adhered, to a considerable extent, to those parts of the parietes at which the shaft had entered and emerged.

LECTURE XVIII.

ON THE MUCOUS MEMBRANES.

OF THE MUCOUS MEMBRANE OF THE ALIMENTARY CANAL.

DIVISIONS TO BE EMPLOYED IN TREATING OF THE ALIMENTARY CANAL—OF THE MUCOUS MEMBRANE OF THE MOUTH—PECULIARITIES OF THIS PORTION—APPENDAGES—VARIETIES IN THE SECRETION OF THIS PORTION—SUPPRESSION OR DIMINUTION—INCREASE—FÆTOR AND METALLIC TASTE—VARIETIES IN TASTE, COLOUR, CONSISTENCE, &c.—EFFECTS ON THE TEETH—THE MEMBRANE SOMETIMES CONCURRENTLY AFFECTED—COAGULABLE LYMPH DEPOSITED—DEFICIENCY OF THE MEMBRANE—REDUNDANCY—INFLAMMATION—DIFFUSED—IN SPOTS—APHTHA—REMARKS ON THE APPEARANCES OF THE MOUTH REGARDED AS SYMPTOMS—SMALL SCATTERED ULCERS—OBSERVATION RESPECTING THESE ULCERS—MORE EXTENSIVE ULCERATION—CONSECUTIVE CONTRACTION AND DISTORTION—FOLLICULAR APPENDAGES, OBSTRUCTED—AFFECTED WITH CANCER—HYPERTROPHY OF THE SUB-MUCOUS CELLULAR MEMBRANE—SPHACELUS OF THE LIPS AND CHEEKS IN CHILDREN—OF THE MUCOUS MEMBRANE OF THE FAUCES AND PHARYNX—PECULIARITIES—DEFICIENCY—EXCESS—POUCHES—CASE—FISTULOUS COMMUNICATION WITH AN OPENING IN THE NECK—POLYPI—NON-MALIGNANT—MALIGNANT—FUNGUS—INFLAMMATION—FROM ORDINARY CAUSES—SPECIFIC CAUSES—ULCERATION—SPHACELUS—FOLLICULAR APPENDAGES—CONGREGATED IN PARTICULAR PARTS OF THE ALIMENTARY CANAL—THEIR USES—ILLUSTRATION IN THE CASE OF OPHIDIAN REPTILES—GREATER PRONENESS TO SEVERE DISEASE—TONSILS—DEFICIENCY—PARTIAL—EXCESS—CHRONIC ENLARGEMENT—ACUTE INFLAMMATION—SEMBLANCE OF ULCERS—SLOUGHING—REMARKS ON THE ACCOMPANYING FORM OF FEVER—SUPPURATION OF THE TONSILS—EARTHY CONCRETIONS—COAGULABLE LYMPH DETAINED IN THE FOLLICLES—MALIGNANT DISEASE—OF THE OTHER APPENDAGES TO THE PHARYNX BESIDE THE TONSILS—OF THE CELLULAR MEMBRANE SUBJACENT TO THE MUCOUS MEMBRANE OF THE PHARYNX—ŒDEMA—SUPPURATION—CHRONIC INFLAMMATION—SPHACELUS—MERCURIAL AND SYPHILITIC SORE-THROAT—MUSCULAR STRUCTURE OF THE PHARYNX—SUPPURATION EXTERNAL TO THE MUSCLES—CASE—SCROPHULOUS TUMOUR—ACCIDENTAL INJURY—THE ŒSOPHAGUS—STRUCTURAL PECULIARITIES—DEFICIENCY—EXCESS—ALTERED SECRETION—POLYPI—CASE—INFLAMMATION—ULCERATION—CICATRIZED ULCERS—CASE—MALIGNANT ULCERS—SUB-MUCOUS CELLULAR MEMBRANE—INFLAMMATION—PRODUCTION OF STRICTURE—REMARKS ON THE TREATMENT OF STRICTURE—MALIGNANT STRICTURE OF THE ŒSOPHAGUS—LOSS OF SUBSTANCE IN MALIGNANT DISEASE OF THE ŒSOPHAGUS—EXTENSION OF THE DISEASE TO OTHER PARTS—CONTRACTILE FIBROUS COAT OF THE ŒSOPHAGUS—ITS ANATOMICAL CHARACTERS—ANATOMICAL CHARACTER OF THE SUBJACENT CELLULAR MEMBRANE COAT—SPASMODIC STRICTURE—DEFICIENT POWER TERMED PARALYSIS—DISEASE IN OTHER TEXTURES PROPAGATED TO THIS.

GENTLEMEN—

Divisions to
be employed
in treating
of the ali-
mentary
canal.

IN describing the morbid appearances of the mucous membrane of the alimentary canal, I shall, as in the case of the mucous membrane of the respiratory organs, proceed to take up different parts in succession. This plan is rendered particularly necessary in treating of the organs which I am about to describe, in consequence of the differences which they present, as to structure, function, and the exciting causes of disease to which they are exposed.

The following are the divisions which it is my intention to employ:—

1. The Mucous Lining of the Mouth.
2. That of the Fauces and Pharynx.
3. The Œsophagus.
4. The Stomach.
5. The Duodenum.
6. The remainder of the Small Intestines.
7. The Cæcum and Colon.
8. The Appendix Vermiformis.
9. The Rectum.

OF THE MUCOUS MEMBRANE OF THE MOUTH.

Of the mu-
cous mem-
brane of the
mouth.

Though the mouth must be regarded as the first part of the alimentary canal, yet, as it is concerned in other offices besides that of digestion, such as articulation and tasting, I do not consider that all its morbid appearances belong to the subject on which we are now engaged.

Most of the affections of the tongue and its appendages must necessarily constitute a separate division: and the affections of the teeth, though organs of digestion, and, perhaps, appendages to the mucous membrane of the mouth, will, of course, require no notice here; since they are fully and ably discussed in this theatre by my excellent friend, Thomas Bell, who is second to none in theoretical and practical acquaintance with this subject.

The mucous membrane of the mouth presents several peculiarities which modify the diseases to which it is liable.

Peculiarities
of this por-
tion.

In the first place, it is directly exposed to the action of the external air, and is, consequently, influenced by the changes in its hygrometric state, and by adventitious matter which it may contain, whether gaseous or consisting of minute particles in suspension: nor is less importance to be attached to the decomposition of the secretions which cover this portion, which the access of air must greatly promote.

Secondly, it is exposed to the injurious agency of a great variety of substances; which may do mischief, by their temperature, their form, or the deleterious properties which they may possess, but which, if not rejected from the mouth, may be greatly modified and mitigated before they are conveyed to most other parts of the canal. The mucous membrane of the mouth, moreover, possesses some structural peculiarities which deserve attention. It has a more complete cuticular lining than any other portion of mucous membrane; that of the vagina, which can alone compete with it in this respect, being, like that of the pharynx and œsophagus, still inferior to it. In those animals which possess a mottled skin, we often see that the *rete mucosum*, as well as the cuticle, may be superadded to a considerable portion of the mucous membrane of the mouth. The lips of the Negro exhibit proofs of a similar arrangement in the human subject. Another peculiarity of the mucous membrane of the mouth, is, that it appears to possess a greater degree of elasticity than any other part of the mucous membrane of the alimentary canal; since, without *plicæ*, it accommodates itself to the greatly varying capacity of the cavity which it lines.

The appendages to the mucous membrane of the mouth are neither few nor unimportant; since we must not only include, under this head, the labial, buccal, and other mucous glands, but also the parotid, the submaxillary, and

Appendages.

the sublingual. The derangements of these last must, however, be deferred for the present; as they do not belong to the derangements of membranes, but rather to those of more solid structures, respecting which I have not, as yet, offered any general remarks.

Varieties in
the secretion
of this por-
tion.

The secretion from the mucous membrane of the mouth is liable to considerable variation, from diminution or suppression, from redundancy, and from modifications of its composition, which may either exist at the time of its formation, or be subsequently produced by the combined influence of air and warmth. The suppression of the secretion which lubricates the mouth is much less frequently the result of the local affection of its lining membrane, than dependent on the general state of the system; in which latter form it constitutes the well-known symptom of thirst.

Suppression,

or

Diminution.

A diminution of the secretions of the mouth may be brought on, as a purely local affection, by the abuse of those means which are calculated to promote their increased production: hence the distress experienced by persons who are in the habit of chewing tobacco, when they happen to be subjected to privation from it.

When the suppression of the secretion is long continued, and the animal heat is raised as a part of the constitutional disturbance which may arise from almost any severe local inflammation, the membrane lining the mouth, and more especially that part which covers the tongue, is apt to become completely dry and parched, more especially if the mouth being constantly kept open favours evaporation and the desiccating influence of the external air.

This state of dryness, if long protracted, is very liable to become the cause of an actual local derangement of the tongue, and the other parts of the mouth; which it is proper to be aware of, when we are appreciating the appearances exhibited by these parts as indices of the states of the system in continued fever and some other diseases. The deeply-chapped tongue which we sometimes meet with in

fever may be adduced as an example of the appearances of the tongue resulting from one of the causes just mentioned.

The increased secretion from the membrane lining the mouth concurs with, and must almost unavoidably be confounded with, the increased secretion of the parotid and other salivary glands; since they appear to be under the influence of precisely the same agents, whether they be such as act locally, like the acrid sialagogues, pyrethrum, tobacco, and the like; or those which act mechanically, such as mastic small pebbles, and other foreign bodies, and even food during mastication; or those agents which operate more indirectly, as mercury, nitric and nitro-muriatic acid, and other medicines which provoke ptyalism; to which ought, perhaps, to be added, the anticipation of receiving into the mouth various articles grateful to the taste, and also the peculiar state of the system which precedes the act of vomiting.

An alteration in the sensible properties of the secretions of the mouth is frequently conjoined with the increase of their quantity. This is particularly notorious in the ptyalism produced by mercury, in which state the metallic taste and nauseating fœtor of the breath are quite characteristic. It may, however, be questioned, whether both of these perversions may not, in part, be attributable to decomposition; since a considerable degree both of fœtid smell and offensive taste is observed to take place where ptyalism has proceeded from other causes, and also where an impediment to the act of deglutition and the stimulus of neighbouring local irritation have occasioned the accumulation and retention of saliva and mucus in the mouth, as we see in various forms of cynanche.

The taste and colour of the secretions in the mouth are liable to be altered during the existence of various diseases: thus, in jaundice, it may acquire a yellow colour and bitter taste; in dyspepsia, it may be salt, sweet, acid, nidorous, or mawkish; whilst, in consistence, it may be either thinner or

Increase.

Fœtor and metallic taste.

Varieties in taste, colour, consistence, &c.

more viscid; and in colour it may be white, from the abundance of minute bubbles, or transparent from their absence. In purpura and scorbutus, it may vary through many shades of dusky red and brown, from intermixed sanies; whilst it acquires an unsufferable fœtor from the decomposition of the same material. In hydrophobia, it is said that, even in man, the quantity of secretion in the cavity of the mouth is increased, and conjoined with a poison capable of reproducing, by inoculation, this fearful malady in another individual.

Effects on
the teeth.

The secretions of the mouth sometimes produce a remarkably corrosive effect on the teeth; and, in some cases, the effect is so local as to render the cause of its limitation difficult of explanation. The deposition of tartar on the teeth and gums is another effect of alteration of the secretions of the mouth. It may be regarded as analogous to calculus in the urinary passages, in the salivary and pancreatic ducts, and in the tonsils. I have arranged tartarous deposits on the teeth, in accordance with this idea, in the Catalogue of our Museum.

The mem-
brane some-
times con-
currently
affected.

Many of these alterations in the quantity and quality of the secretions appear to take place, as Louis has remarked, with little or no derangement of the mucous membrane upon which they are spread: nevertheless, its superficial appearance may be very much modified, by the deposition of the animal matter which these secretions contain. In this way, a thick coating of fur is often deposited on the tongue, gums, and teeth; varying in colour, from yellowish-white to dark-brown or black sordes. By the protracted continuance of these deposits, which are liable to become extremely offensive, the parts on which they rest are apt to become secondarily irritated, and even ulcerated. This is more particularly the case with the tongue and cheeks; the soddened and œdematous state of the parts, and the pressure of the teeth, essentially contributing to produce this effect.

Besides these alterations in the secretions of the mouth in which its mucous membrane is only slightly or secondarily deranged, there is another, which deserves attention, in which the membrane is more decidedly in a state of inflammation. I allude to the deposit of coagulable lymph upon its surface, to which it is pretty firmly adherent. It is observed investing the tongue, and also the fauces and back part of the pharynx, in an advanced stage of typhoid fevers, and in some other forms of severe inflammatory affections. It has been regarded as one of the certain prognostics of approaching death; and I have seen it pointed out as such by a distinguished pathologist in a foreign hospital. This state of the lining membrane of the mouth and fauces has particularly arrested the attention of Professor Louis; who has shewn that it is not to be regarded as the fatal prognostic which it has been imagined. Though it certainly belongs to a very severe form of disease, and is generally met with in enfeebled and exhausted patients, recovery may nevertheless ensue. This remark I have confirmed by my own observation.—Louis has likewise shewn, that this condition of the parts in question is to be regarded as essentially consisting in the local inflammation of the membrane upon which the layer of lymph is situated: and I should, in consequence, have introduced it when speaking of the membrane itself, rather than in this place, had I not wished to point out the distinction which it is desirable to make between this and other deposits in which the secretions themselves perform the principal part. I may also take this opportunity of remarking, that, first, the persistence, and, subsequently, the separation of the thick coat by which the tongue is not unfrequently covered, appear to afford satisfactory evidence, that though this coating may be principally derived from the secretions collected in the mouth, the mucous membrane which it covers is essentially concerned.

Coagulable
lymph de-
posited.

Congenital deficiency of the mucous membrane of the

Deficiency
of the
mucous
membrane.

mouth is occasionally seen in connection with malformations of the cavity which it lines; as, for example, hare-lip, cleft palate, and cleft velum. Acquired deficiencies are occasionally met with as the result either of those diseases which produce destruction of parts composed of or covered by this mucous membrane; such as, syphilis, siccins, phagedenic ulceration, and cancer; or of various accidents and

Redundancy.

operations. A redundancy of this portion of the mucous membrane of the alimentary canal is of comparatively rare occurrence: it may, nevertheless, take place; 1st, in the lips, and more especially the upper lip, which is sometimes seen very much everted; or, 2dly, covering a projecting process extending from the symphysis of the superior maxilla, or covering tumours developed in those parts which concur in the formation of the mouth. Such instances possess comparatively little interest, as respects the mucous membrane; since, although serious and fatal consequences may follow, they generally belong rather to the subjacent textures, than to the mucous membrane by which they are invested.

This portion of the mucous membrane of the alimentary canal appears to be liable to few anomalies dependent on original conformation: nevertheless, that condition of the *frænum linguæ* which is met with in children who, in popular language, are said to be tongue-tied, may be regarded as an irregular distribution of this membrane.

Inflamma-
tion.

Diffused.

Idiopathic diffused acute inflammation of the mucous membrane lining the mouth is a rare occurrence. Inflammation of this part is occasionally induced by hot and acrid substances taken into the mouth. The acute pain and exquisite sensibility which follow, attest the high degree of organization of the part. It is not unfrequently attended by a peculiar morbid appearance, depending upon the structure of the upper portion of the alimentary canal; viz. its cuticular covering is detached in considerable flakes. Although idiopathic inflammation of the mucous membrane of the mouth very seldom occurs in a diffused and extended form, its

existence in small detached spots is by no means uncommon. In spots.
 It constitutes that affection to which the name of 'aphtha' has Aphtha.
 been applied. The inflamed spots in this affection are often extremely numerous, and, by their coalescence, may occupy a large portion of the interior of the mouth. They commence as vesicles, by the elevation of the cuticle; but they remain so short a time in this state, that the vesicular form has been generally overlooked. The raised cuticle soon becomes detached; but is presently succeeded by a fresh irregular white covering, which is doubtless produced by the secretion of lymph from the denuded surface. This is likewise soon detached; but is followed by a succession of similar productions, as long as the complaint lasts. When these white crusts have separated, and before the new covering is produced, the exposed mucous membrane is generally seen of a bright red colour; yet it may present different shades of livid or purple, dependent on the state of the patient, induced by other causes; as, for example, the existence of pneumonia or bronchitis. Infants of a few weeks old are the most subject to this affection; and the tongue, and inside of the cheeks near the mouth, are the parts most liable to it. It is extremely probable that the efforts made by the infant, in the act of sucking, principally contribute to promote this predisposition; which is not altogether disproved by the fact, that infants brought up by hand are at least as liable to thrush as those who live by the breast; since the use of sucking-bottles, and the instinctive movements of the child's mouth, would be quite sufficient to produce the increased excitement of these parts.

An aphthous state of the mouth in the adult is said to concur with miliary eruption on the surface of the body. In one instance in which I observed this combination, it was by no means improbable that the patient laboured under visceral disease. Although an aphthous state of the mucous membrane of the mouth is probably the principal local affection in the case of infants (for the idea that the disease

extends throughout the whole course of the alimentary canal must be absolutely rejected as impossible), we seldom see this morbid appearance in adults, except as a complication taking place towards the close of some serious disorder, and more especially of such as are attended with great and somewhat rapid emaciation; as, for example, pulmonary consumption, and extensive disease of the small intestines. Even in cases of this kind in which this secondary aphthous affection exists to a great extent, and really becomes, as a local affection, a very serious and distressing addition to the primary disease, it is, nevertheless, as an index of the state of the system, and as the frequent prognostic of approaching death, that it is principally regarded as important. It not unfrequently happens that the mucous membrane of the tongue and other parts of the mouth exhibit a morbid cleanness, and a bright red colour, nearly resembling the raw muscular fibre of beef. Like the aphthous state which I have just described, and to which it is, in fact, very closely allied, it is accompanied by an exquisitely increased sensibility; and is also to be regarded as an important indication of the state of the system, generally connected with some serious visceral derangement, and accompanied with considerable emaciation.

Remarks on
the appear-
ances of the
mouth re-
garded as
symptoms.

I do not know that I can take a better opportunity than the present, in conjunction with the two last-mentioned morbid appearances of the tongue, to offer a few remarks respecting the importance and value to be ascribed to various conditions of the mouth and tongue, as symptoms or tokens in disease. Some of these appearances, as I have already remarked, and as Louis has ably pointed out, really depend on a morbid condition of the parts immediately concerned; but they ought not on this account to receive the less attention, since the affection is not the less symptomatic, and consequently may throw important light on our investigation of the principal seat of disease. Since the promulgation of the doctrines of Professor Broussais,

almost every modification of the appearance of the tongue has been regarded, by the advocates of those views, as dependent on and indicative of the condition of the mucous membrane of the stomach. This, however, is by no means strictly the case. The derangements of the mucous membrane of the alimentary canal are not always continuous; but, on the contrary, it frequently happens that a limited portion is greatly deranged, whilst the remaining portions retain their integrity. This is as strictly true with respect to the mouth as with any other part of the canal. I have already adduced one example of this, in contradicting the opinion that aphtha in the mouth is merely a part of a general affection of the whole canal. The mouth, and more especially the tongue, may not only be the seat of a local affection purely its own, and consequently not indicative of the state of the stomach, but it is also liable to have its appearance variously altered in conjunction with the derangements of different parts of the body, besides the stomach, or even the alimentary canal. This subject has also been well treated of by Louis, who, in his work on typhus fever, not only refutes the Broussaian notion of the appearances of the tongue being necessarily indicative of the state of the stomach, but gives the result of numerous careful observations respecting the state of the tongue in various other affections besides those of the stomach. Louis, however, was not the first to point out this fallacy; which, after all, was limited to the adherents to the Broussaian doctrine. In the year 1822, I heard Rostan, himself a modified Broussaian, warning his disciples against this erroneous opinion, and pointing out the state of tongue which was at that time by some regarded as pathognomonic of gastritis, as frequently present in pneumonia and other acute inflammatory diseases. In this country I am not aware that the error ever prevailed; but amongst the various appearances presented by the tongue, some have been regarded as

indications connected with the alimentary canal, and others with derangements of other parts of the body. Thus a peculiar white and loaded state of the tongue has long been observed as a frequent concomitant of acute rheumatism. The bright diffused red colour of the tongue, with prominent papillæ, is no less familiar as concurring with the red colour of the skin in scarlet fever. An œdematous state of the tongue, causing it readily to receive the impressions of the teeth, has been particularly pointed out by my friend Dr. Marshall Hall, as indicative of a loaded state of the colon. Some practitioners have believed that they could recognise hepatitis from the appearance of the tongue; and the late Dr. Currie went so far as somewhat fancifully to connect a particular appearance of that organ with inflammation of the lobulus Spigelii.

Small scattered ulcers.

The mucous membrane of the mouth, but more especially of the lips and cheeks, is occasionally the seat of small scattered or even solitary ulcers, which cannot be regarded as aphthous: they possess, for the most part, a well-defined rounded figure: the edges, which are sharply cut, are not elevated; the ulcerated surface has a whitish colour; the pain attending them is often much more considerable than the size and appearance of the affected spot would induce one to suspect; and there is frequently a manifest febrile excitement of the system accompanying them. Although relieved, or even cured, under purely local treatment, they appear to be far more under the influence of mild general antiphlogistic means. Although the spots, of which I have just spoken, possess in themselves but little importance, I conceive that some considerations may be connected with them which are not without considerable general interest, though they more particularly relate to the derangements of the alimentary canal. Before I propose these considerations to your attention, I must remark, that ulcers, very similar in appearance to those which I have just described, may at any time be produced

Observation respecting them.

at will by the mere mechanical removal of a small portion of the lining membrane. This must be quite familiar to those who are in the habit of biting the inside of the lip; but the spots so produced are, however, merely attended with local pain; and this is not only much less severe, but very different in kind, from that which attends the ulcer spontaneously produced, although the latter may be much inferior in size. The constitutional disturbance is altogether absent in these cases of accidental ulceration.—This apparently trivial observation has long appeared to me to militate against some of the points of the *soi-disant* physiological doctrine; because it seems clearly to prove that there are essential differences in the mode of irritation to which a particular part is liable; and, 2dly, that the attendant disturbance of different functions going on in the system are not merely to be referred to the particular sympathies which belong to the part primarily affected; though, were even this to be admitted, it would be scarcely regarded as an explanation, since it would only change the name of the obscurity attached to the subject.

I observe that Louis has adopted a somewhat similar course of reasoning, in speaking of accidental lesions of the mucous membrane of the stomach:—but of these hereafter.

The mucous membrane of the mouth is liable to more extensive ulceration. This is especially met with in two classes of patients; viz. in cachectic children, and in those who are suffering from the abuse of mercury. In both cases, the ulcers assume an unhealthy character, are principally seated where the pressure of the teeth and the presence of vitiated secretions favour the production and continuance of irritation, and are much disposed to spread. When the progress of these ulcers has been arrested, which is not always easily effected, there may still be considerable difficulty in preventing the formation of adhesions, and in counteracting the inconvenience and distortion occasioned

More extensive ulceration.

Consequent contraction and distortion.

by the contraction attendant on cicatrization, more especially when the subjacent structures have been deeply affected.

Follicular
appendages
obstructed.

The appendages to this portion of the mucous membrane of the alimentary canal do not offer many morbid alterations, to arrest our attention. The labial and buccal glands are liable to distension from retained secretion; and the little tumours so produced have a defined rounded figure, a translucent appearance, and considerable firmness. As these characters are very similar to those which may be presented by the early stage of tumours of a malignant nature, it is well to be guarded against mistaking them. Acupuncture will immediately remove doubt, where it exists, by allowing the escape of the secretion, when there is distension from that cause.

Affected
with cancer.

The labial glands are the most subject to malignant disease, which is apt to extend to the other textures composing the lips; and extensive destruction of parts may be caused by the consequent ulceration. The gums are occasionally the seat of fungoid disease; but it is not easy to say what is the precise texture in which it commences, since it may be connected with the periosteum of the jaw, or proceed from within the alveolar process.

Hypertrophy of sub-mucous cellular membrane.

The cellular membrane subjacent to the portion of mucous membrane now under consideration is sometimes the seat of hypertrophy, which appears to be congenital. It may affect one lip, especially the upper. I have seen it accurately limited by the median line, and affecting the tongue as well as the cheeks and lips.

Of sphacelus in the cheeks and lips of children.

In children who have suffered from acute and severe disease, inflammation of the mouth sometimes proceeds to the production of sphacelus of all the textures, not excepting the common integuments. This disorganization proceeds rapidly, produces a dark and almost black colour, and is quickly fatal.

OF THE MUCOUS MEMBRANE OF THE FAUCES AND PHARYNX.

This portion of the canal presents several modifying peculiarities; some of which nearly resemble those of the mucous membrane of the mouth; whilst others are of a more peculiar character. In the first place, it is very much exposed to the action of the external air; and is consequently liable to be influenced by the changes in its hygrometric state, and from adventitious matter which it may contain, whether gaseous, or consisting of minute particles in suspension. Secondly, it receives whatever is taken into the mouth for deglutition, before its temperature and other sensible properties have received any other modifications than that which they undergo, in the mouth, from mastication and the addition of saliva; but this modification, in the case of articles which are highly deleterious or offensive to the palate, is almost reduced to nothing, by the shortness of the time they are allowed to remain in the mouth. Thirdly, its form is complicated; presenting folds, crevices, or angular cavities and partial contractions. Fourthly, the appendages to the mucous membrane are numerous. Amongst these are the tonsil glands, which themselves constitute a very important seat of disease. Fifthly, the truly muscular apparatus subjacent to the mucous membrane is more complicated, powerful, and varying in its movements than the contractile fibrous layers superadded to the other parts of the alimentary canal. Sixthly, this portion of the canal is also liable to disease, which may, by continuity, be propagated to it from the tongue and the larynx.

Peculiarities.

The mucous membrane of the fauces and pharynx seldom, if ever, presents an instance of deficiency, excepting where there may be also a considerable deficiency of other parts, from congenital deformity. Acquired partial deficiencies are sometimes the result of extensive destructive ulceration; as, for example, from syphilis, siccans, and the abuse of mercury. Sometimes the velum-palati is altogether

Deficiency.

removed: sometimes it is perforated, and rendered cribriform: sometimes it is irregularly contracted, or otherwise distorted, in consequence of one or the other of the above-named affections.

Excess. A morbid or abnormal condition of the fauces and pharynx, dependent on excess, is as unusual as the opposite state which I have just been describing. Nevertheless, some striking instances of this class are stated to have been met with. Dr. Baillie has mentioned a pouch occurring at the lower part of the pharynx; which I shall describe on his authority, never having met with any thing of the kind myself. I shall give his own words:—"The lower extremity of the pharynx has been known to be dilated into a pouch of considerable size, which passed behind the œsophagus. This may be supposed to be very rare; but there is an instance of it preserved in William Hunter's Museum. The pouch, in this case, began to be formed in consequence of a cherry-stone having rested there for some time, and which had made a kind of bed for itself. It remained in that situation for three days, and then was brought up by a violent fit of coughing. A part of the food always afterwards rested in the cavity made by the cherry-stone, and thus gradually enlarged it. At length, in the course of about five years, the cavity was enlarged into a bag of considerable size, sufficient to contain several ounces of fluid. This bag passed down a good way behind the œsophagus, and the œsophagus necessarily acquired a valvular communication with it. In proportion as the bag enlarged, this valvular communication must have become more and more complete; till at length every kind of food must have rested in the bag, and could not pass into the œsophagus. In this way the person was destroyed. The lower end of the pharynx is perhaps the only part of the canal where such an accident can happen."

Fistulous communication with the neck.

Professor Carus, of Dresden, has noticed a fistulous communication between the pharynx and an orifice in the

neck, which he regards as the remains of a condition belonging to the foetal state, analogous to the bronchial openings in fishes.

We find at this part a morbid appearance, which may be regarded as a kind of partial hypertrophy: it is known by the name of polypus of the pharynx. Two kinds of polypi are described as occurring at this part; the non-malignant, and the malignant. I have already alluded to them in my preliminary general remarks, and therefore feel that it would be superfluous for me now to repeat their anatomical characters: they nevertheless occasion some peculiar derangements, dependent on their seat; the notice and description of which belong to this place.

Polypi of a non-malignant character attached to the mucous membranes of the posterior part of the nasal passages may hang down and occupy part of the pharynx. Sometimes they are attached to the turbinated bones: they are also said to have been similarly connected with the cuneiform process of the os occipitis. I believe they may also take their origin from the pharynx itself; but I have never had an opportunity of seeing them so attached, either during life or after death. I have known sudden death produced by a polypus, almost in a state of sphacelus, falling upon the upper part of the trachea, so as to close the rima glottiditis: the polypus, however, had been removed from its attachment: I can therefore only suspect that it grew from the pharynx.

Malignant polypi in the œsophagus consist of pedunculated fungoid tumours, implicating the mucous membrane and the immediately-adjoining cellular structure. In a well-marked case of this kind, which occurred in this hospital, the fungoid growth occupied the lower part of the pharynx, extending, in some degree, to the œsophagus. It occasioned very great difficulty of deglutition, and a considerable tumour in the throat. The larynx was pushed forward; the parts adjoining were somewhat swollen; a degree

of movement was communicated to the swelling by the act of deglutition, as well as some pulsation from the carotids. The diagnosis was consequently rendered obscure, until the nature of the affection was revealed by a portion of one of the fungoid bodies being detached, and brought up.

Fungus. Dr. Bailey has described what he calls fungus in the pharynx, situated near its termination in the œsophagus, which seemed to be also implicated in the disease. He says, that, when cut into, it appeared to have a fibrous structure, disposed, in some measure, at right angles to the mucous membrane upon which it was formed, and it was ulcerated on its surface. This description is not sufficiently minute to enable me to form a positive idea of its nature; but I suspect that it must have been allied to some forms of cancer of the lip and of warty fungus of the skin.

**Inflamma-
tion**

There is, perhaps, no portion of the alimentary canal more prone to inflammation than the fauces; which, besides the structural conditions to which I shall presently advert, are peculiarly exposed to the exciting causes of disease; since they are incessantly receiving the inspired air, whether inhaled by the mouth or the nostrils. This air is not merely variable in its temperature and hygrometric state, but in the rapidity of its passage; and the surface with which it comes in contact cannot escape the influence of these changes: hence cynanche, or inflammation of the throat or fauces, is sometimes so prevalent, as to merit the appellation of epidemic. Some individuals are peculiarly liable to the affection, which in them is induced by the slightest causes of the kind referred to.—This inflammation presents every gradation, from the most trivial to the most severe. It often furnishes an illustration of a remark which I have already made, that the edges of plicæ or folds of mucous membranes are peculiarly prone to inflammation; the margin of the velum and the pillars of the fauces being, in many cases, principally, if not solely affected. When the inflammation has been long continued, or has

**from ordina-
ry causes.**

repeatedly occurred, the membrane appears thickened, the vessels of the affected part are more or less permanently enlarged, the velum and uvula appear tumid, and there is evidently a degree of relaxation accompanying such chronic inflammation.—Inflammation of the fauces is likewise apt to occur in conjunction with continued fever, erysipelas, and small-pox. To scarlatina it is almost an essential and inseparable adjunct. It is likewise concomitant to syphilis, mercurial cachexy, and sibbens.

Ulceration is by no means a rare result of inflammation of the throat. It commonly affects the velum, uvula, and pillars of the fauces; and I have seen some very obstinate cases, in which superficial ulceration of considerable extent occupied the posterior part of the pharynx, when it evidently commenced in the firm and continued adherence of the secretion.—When the ulceration is connected with syphilis, mercurial cachexy, or sibbens, it is very apt to become phagedenic: and when the progress of the disease has been stopped, the cicatrization and accompanying contraction often occasion great deformity, producing dysphagia and perversion, or loss of voice.

Acute inflammation of the fauces sometimes proceeds to the production of sphacelus, in which the tonsils and neighbouring parts are concerned: a dirty, sanious, and offensive fluid proceeds from the affected parts; the disease spreads rapidly, and is most intractable. It is attended with the most severe constitutional symptoms. It occurs in children, and appears, at times, to be epidemic.

The follicular appendages to the mucous membrane of the pharynx deserve some attention in their normal state, before we proceed to consider the morbid appearances connected with them. It is worthy of remark, that these appendages to the mucous membrane are by no means uniformly scattered throughout the whole course of the alimentary canal. It will therefore be important, that, as we proceed to take up the derangements of different portions

Specific causes.

Ulceration.

Sphacelus.

Follicular appendages.

Follicular
appendages
congre-
gated in
particular
parts of the
elementary
canal.

Their uses.

in succession, we should notice those spots in which they are particularly numerous; since there can be little doubt but that, during health, they have an especial function to perform; and also, that, when deranged, they must occasion more or less striking peculiarities, dependent, first, on the diminution of the function of these glands, and, secondly, on the peculiar nature of the constitutional irritation which is often observed to attend their inflammation. The first of these portions of the canal marked by the number and extent of its follicular appendages is that which we find at the upper part of the pharynx: in which designation I mean to include not only the amygdalæ, but also the numerous and strongly developed follicles at the root of the tongue, posterior to the papillæ capitatæ. The follicles of this part, notwithstanding their number and extraordinary development, are nevertheless to be regarded as consisting of individual glands, rather than collectively, constituting an organ, as in the case of the tonsils. On inquiry into the use for which these glands are thus partially collected, it would seem that they are intended, by the abundance of their secretion, to facilitate the passage of food in particular stages of the process of digestion, through parts of the canal at which some degree of impediment might exist. Thus, at the part which we are now considering, we see that the food, more or less reduced to a pulpy mass in the mouth, is propelled, by an appropriate degree of force in the muscular apparatus, over the closed glottis, into the pharynx. There would, therefore, without this provision for a superior supply of mucus, be a degree of friction or attrition at this part, which, by frequent recurrence, could scarcely fail to produce an injurious effect. The degree of pain which is felt on deglutition, when the secretion of this part is diminished, and the absolute suffering which attends it when this part is even slightly inflamed, tend to confirm the observation which I have just made.

In the ophidian reptiles, which often take into their

mouths and swallow bodies which appear greatly disproportioned to the size of the canals through which they have to pass, the production of mucus from the mouth and fauces is very abundant, as a preparation for deglutition; and the covering of this substance, which the mass to be swallowed thus receives, doubtless greatly facilitates its passage through the long œsophagus of the animal. Something of the same kind very probably takes place in man; since the mucus produced by the tonsils, and glands about the base of the tongue, not merely facilitates the passage of the food through the isthmus of the fauces, but affords it a covering, to aid its passage through the œsophagus to the stomach.

Illustration
in the case
of ophidian
reptiles.

The parts of the alimentary canal which are thus supplied, in a superior degree, with apparatus for the secretion of mucus, exhibit the counterpart to the activity of their secernent function in health, in their proneness to disease, and in the activity and severity of the local and general symptoms which attend it.—This remark is fully exemplified in the part which we are now considering. We see that it is particularly prone to disease, from the operation of a variety of causes. An unusually dry state of the atmosphere, or an unaccustomed or a partial exposure to a current of cool air, or to wet, will, in some persons, inevitably produce an inflammation in this part. The derangement may be purely local, and the individual feel no other inconvenience than the pain and difficulty of swallowing, his general health appearing to be unchanged: but it more often happens, that those individuals, who have a great proneness to inflammation at this part, have it only as a part of a general weakness of constitution; in consequence of which, not the fauces only, but the whole system becomes disturbed by the exposure; and the decided symptoms of a febrile state may be observed simultaneously with, if not antecedent, to the local affection. This remark accords with the observation which I have already made, respecting a marked difference between ulcers in the mouth connected with general derange-

Greater
proneness to
severe dis-
ease.

ment of the system, and those induced by purely local causes. The fauces are not only frequently deranged in the manner which I have just described, and which will sufficiently account for sporadic cases of cynanche;—they are also frequently deranged by epidemic and specific influences. The former may often be traced to the state of the weather; but, at other times, they are enveloped in the mystery which attends the production of many other epidemics. The specific influences, by which this part is subjected to acute disease, are, the morbid poisons of scarlatina, cynanche maligna, and syphilis. It may, however, be questioned, whether the first are really two diseases, and not rather varieties proceeding from the same source. Although, as I have already remarked, the mucous membrane generally, as well as its follicular apparatus, is often excited to intense inflammation from the operation of the specific causes in question, it falls with particular severity upon the tonsil glands, causing them not only to present the various appearances produced by active inflammation, but sometimes passing into a state of gangrene or sphacelus.

Tonsils :— I am not aware of the tonsil glands ever being absent, unless it be where there is an absolute deficiency of the part of the canal in which they are situated. They are sometimes very small, and, indeed, scarcely discernible; but I believe, that even in this state, which is by no means an unhealthy one, they are fully competent to perform the office appointed them. A partial deficiency may occur, as the result of disease or operation. An instance of the former is seen after scarlatina, when it has occasioned sloughing of the glands. The latter case occurs when the partial excision of the tonsils has been resorted to, in consequence of their chronic and permanent enlargement. I know of no instance of a redundancy, as to the number of these glands; yet, *à priori*, I can see no difficulty in conceiving the possibility of their occurring double on one or both sides. Their existence, of an undue size, is one of the most

deficiency—
partial—

excess :

common morbid appearances which we meet with in the fauces. We find this state in children, at a very early age; and there can be very little doubt that it is absolutely a congenital condition: the enlargement, however, in most cases, does not depend on mere hypertrophy, but is accompanied by an alteration of structure, which is doubtless to be referred to chronic inflammation or irritation. In this state, the tonsils form large rounded projecting masses, not unfrequently meeting each other, and, consequently, greatly interfering with the passage of air and food. In extreme cases, they considerably modify the mode of respiration; not only causing dyspnoea, but occasioning a peculiar sound, more especially audible during sleep; and also a peculiarity of attitude and expression of countenance, which is so characteristic, that we may recognise this state of the throat without even looking into the patient's mouth. When the tonsils are enlarged in the way of which I am now speaking, they seriously interfere with the well-being and vigorous growth of the child. This result seems to be more the effect of impaired respiration, than that of impeded deglutition. The tonsils in this state are likewise, occasionally, the cause of deafness, by their interference with the lower extremity of the Eustachian tube. The tonsil glands in this enlarged state may be either quiescent, and unattended with irritation; or they may be in a state of active inflammation, which is very prone to attack them. In the former condition, they are pale, firm, and little sensible: their follicular orifices are large, producing a sort of quilted appearance. Attempts are often made to reduce the size of tonsils thus affected, by the application of various astringents; and lunar caustic, in particular, has been strongly recommended; but I believe that the benefit derived from such measures is, in most instances, rendered imperfect by the deposition and consequent change of structure which inflammation has occasioned. In cases of the greatest apparent success, the relief may be merely transient. I have, therefore, no hesitation

chronic enlargement.

in giving decided preference to the method of excision, as that which affords, with little trouble, a permanent and effectual remedy, and, at the same time, removes much of the probability of their relapsing into an inflamed state, to which they are very liable. It also renders of comparatively little importance the recurrence of inflammation, should it take place.

Acute inflammation.

Of the inflamed state of enlarged tonsils I shall speak presently; but I must first notice the inflammation of these glands, independently of previous disease in them. Whether this inflammation assume the milder form of *cynanche tonsillaris*, or the more severe form of *cynanche maligna*, we find it attended with increase of size, intense redness, and considerable pain; which is, perhaps, as much to be referred to the surrounding parts, as to the tonsils themselves. The orifices of the follicles are frequently marked by the altered secretion which they pour out. It seems to approach to the character of coagulable lymph, and produces a light-coloured spot, which is very liable to be mistaken for a slough or ulcer; but they are generally thrown off when the patient recovers, without any abrasion or loss of substance. Sometimes, these spots become adherent to the substance of the tonsil; probably in consequence of this altered secretion being accompanied by a deficiency in that of the mucus, which is natural to them. In such cases, the tonsils bleed when attempts are made to remove these spots, and some degree of ulceration appears to exist beneath them.

Semblance of ulcers.

Sloughing.

It is by no means improbable that the adhesion of these spots of lymph, when the warmth of the system and the influence of the air promote their decomposition, may materially aggravate the inflammation of the tonsils, and increase the tendency to partial sloughing, to which these glands are very prone. This consequence, I conceive, is more likely to ensue, when the causes of severe inflammation and *sphacelus* operate upon tonsils, which, though considerably increased in size, are impaired, as respects their

vital properties, by the chronic derangement which we have recently considered. In such cases, large portions of the tonsils may be speedily destroyed; the mouth is charged with sordes, the breath is horribly offensive; deglutition and the application of the necessary local remedies become extremely difficult, and the destructive sloughing is apt to extend to neighbouring parts. The constitutional derangement which is present in these destructive cases of cynanche maligna is deserving of special attention; not merely as forming a most fearful and often untractable part of the complaint, but on account of the pathological considerations which it suggests with reference to some other related forms of disease. The fever accompanying cynanche maligna is, I believe, universally described as essentially of that character to which the appellation of typhus is applied.—On what does this character depend? Is it inexplicably brought about by the operation of the same specific cause which led to the cynanche? Can we ascribe it to the peculiar sympathies of the parts affected? Has the occurrence of sphacelus any thing to do with producing it? or is it, rather, that the local affection of the throat, in these cases, is complicated with that of another portion of the canal, of which I shall have to speak of in due course—I mean, the patches of aggregate glands in the small intestines, to the derangement of which, the accurate and laboriously minute observer, whose name I have often quoted—Professor Louis—considers that fever of typhus character is essentially connected? I shall return to this subject, when I shall have to speak of the aggregate glands of the small intestines.

Remarks on the accompanying form of fever.

The tonsils, more especially when they are in a state of chronic enlargement, are liable to attacks of acute inflammation, which, instead of tending to gangrene, produce suppuration. The quantity of matter collected is sometimes so great, as to distend the tonsil to a very considerable size; and I have known deglutition, and even

Suppuration of the tonsils.

respiration, absolutely prevented, the patient dying before an attempt could be made to let out the matter. The matter evacuated from these collections, either spontaneously or by incision, is generally of a peculiarly horrible fœtor; which seems to indicate, that though not directly exposed to the air, it comes under its septic influence. The deposition of calculous concretions sometimes takes place in the tonsils. These calculi are said to be composed of phosphate or carbonate of lime, intermixed with animal matter. I cannot state, from observation, the precise seat of these calculi; but I suppose that they are lodged in the deep follicles of the enlarged tonsil, where I conceive that they are formed by the separation of earthy salts from the secretion of the gland. They may, however, have originated as a sequel to suppuration, when the puriform secretion, whether fluid or concrete, has not been fully evacuated, and has subsequently been penetrated by earthy salts.

Earthy concretions.

These glands are occasionally the seat of another deposit, which is likewise to be referred to follicular secretion. I have already stated, that, under the influence of inflammation, this secretion acquires, in some degree, the character of coagulable lymph; which it may do in conjunction with a somewhat chronic inflammation, as well as when it is acute. This secretion, when retained, not only distends the tonsils, but acquires an unsufferable fœtor, which affects the breath. This inspissated and offensive secretion may sometimes be removed by mechanical assistance. The late Allan Burns, of Glasgow, in his last illness, laboured under the affection of which I am now speaking; from which he received some little relief by the method I have mentioned, *i.e.* by extracting the offensive inspissated secretion from the follicular cavities.

Coagulable lymph retained in the follicles.

Malignant disease.

I am not aware of any instances of primary cancerous, fungoid, or other malignant affections of the tonsils; yet analogy induces us to infer that they might be the seat of morbid appearances of this class. Cancer of the root of the

tongue, and of other parts of the pharynx, sometimes extends to the tonsils.

OF THE OTHER APPENDAGES TO THE PHARYNX, BESIDES THE
TONSILS.

In this class I must include, as I have already hinted, the chain of large glands extending along the root of the tongue. These last, I believe, generally participate with the tonsils in the inflammatory state which constitutes angina tonsillaris and angina maligna: they are liable to similar suppression, and augmentation of their secretion. Though they are subject to some degree of hypertrophy, it is insignificant, compared with that which we have noticed as occurring in the tonsils. These structures may become the seat of malignant disease, extended to them from other parts of the tongue.—I am not aware of any remarkable morbid appearances connected with the muciparous glands scattered over the mucous membrane of the pharynx; yet it is evident, that they must participate in any severe attack of inflammation affecting that membrane, and in the suppression and increase of the secretions of the part.

OF THE CELLULAR MEMBRANE, AND MUSCULAR STRUCTURES SUB-
JACENT TO THE MUCOUS MEMBRANE OF THE PHARYNX.

This cellular membrane is liable to become œdematous, from an inflammatory serous effusion accompanying acute inflammation of the membrane to which it is subjacent. œdema.

The inflammatory condition of this cellular membrane sometimes proceeds to the production of pus, which, like the serous effusion, is generally diffused as an infiltration, rather than collected in abscess. It appears to be connected with that form of inflammation of the mucous membrane which may be regarded as allied to the erysipelatous inflammation of the common integuments with which it sometimes concurs. Suppuration.

By repeated or long-continued and chronic inflammation, the cellular membrane beneath the mucous membrane of Chronic inflammation and semicar-tilaginous induration.

the pharynx becomes thickened and indurated, so as to present a semicartilaginous character. I have seen this in the velum palati and uvula.

Sphacelus.

Mercurial
and syphili-
tic sore-
throat.

Partial inflammation and death of the submucous cellular membrane of the rugæ which we are now considering sometimes take place in those parts where it is particularly lax; such as, the velum, and pillars of the fauces. The affection of which I am now speaking seems to be, in some respects, allied to anthrax. A small portion of the cellular membrane dies, or at least comes into that state in which its separation is required; the adjoining portions suppurate slightly; the mucous membrane covering it exhibits a livid red spot, and ultimately ulcerates, and exposes a ragged dirty yellow surface; the ulcer is not disposed to heal, but, on the contrary, its ragged edges extend themselves, and considerable destruction of parts is often the consequence. You have probably recognised, in the description which I have given, those ulcers which we frequently see in the throats of persons who have been affected with syphilis; yet I must confess myself sceptical with respect to the idea of their being, in many instances at least, the effect of syphilitic virus. I cannot help rather regarding them as the miserable effects of the mercury, which had been employed as the antisymphilitic remedy. They appear to me to be completely analogous to other effects of that fatal poison, and dreadfully abused medicine. It is some corroboration of this view, that ulcers of the kind of which I am now speaking occur in persons who have taken largely of mercury, where there was no suspicion of any venereal taint existing: thus I have seen some well-marked cases of this affection, where mercury had been given for the purpose of relieving the system from cholera, or for the cure of symptoms suspected to be connected with that disease. In one of these cases, in which the progress of the disease in the throat was slow, and presented the stages which I have above described, there was a striking ten-

dency to the formation of small anthraces in different parts of the body, which pursued a course very similar to the ulcers in the throat. The ulcers which they produced were likewise similar to those in the throat.

Although I have mentioned these ulcers as commencing in the sub-mucous cellular membrane which they ultimately denude, I am far from concluding that they always commence in this manner.

I believe that the mucous membrane itself is sometimes the structure originally attacked: I think that this is most frequently the case when the ulceration has really been of a venereal character.

The muscular structure of the pharynx is very seldom the subject of disease. I am not aware of any morbid appearances which can be said to belong to it; but it may, at times, be implicated in disease extending to it from other parts. The contractions of these muscular fibres may be subject to irregular action; and a spasmodic constriction may interfere with deglutition, as well as in the case of spasmodic contraction of the œsophagus.

Muscular
structure of
the pharynx.

Inability to swallow has been ascribed to a paralytic loss of power in the muscular structure; but I must confess that I am at a loss to conceive how true paralysis of the pharynx and œsophagus can take place.

The cellular membrane external to the muscles of the pharynx is sometimes the seat of inflammation; and pus being produced, a communication has been formed between the cavity containing it and the pharynx. The following account of a case of this kind is given by Dr. Munro, in his work on the Morbid Anatomy of the Gullet, &c. p. 484. "Considerable abscesses frequently form in the neck, and, particularly when situated beneath the deep cervical fascia, impede, to a great degree, deglutition and respiration. The late Mr. J. Bell gave me an excellent specimen of this disease:—

Suppura-
tion exter-
nal to the
muscles.

"The patient, a man of middle age, had a deep scrofulous Case.

abscess occupying the right side of the neck, displacing the trachea, and causing slight difficulty in swallowing and breathing. The tumour increased gradually, became very painful, protruded into the fauces, and almost entirely occupied the pharynx. An incision was made into the lower part of the tumour, and about three pounds of purulent matter were discharged: the respiration and deglutition became easier, and the internal swelling disappeared. Hectic symptoms supervened. Eighteen days after the incision, the internal swelling gave way, and discharged its contents into the pharynx. A short time only had elapsed, when it was observed that all the ingesta passed into the cavity of the abscess, through the ulcerated apertures in the pharynx, and compressed the œsophagus. Attempts were made to support the patient's strength, by injecting nutritious fluids, through a catheter, into the stomach; but he gradually sunk, from inanition.

“ Upon dissection, the pharynx was found much ulcerated; and the abscess communicated with the œsophagus.”

Case. In a remarkable specimen in the Museum of the University of Edinburgh, all the cellular substance around the trachea and gullet was much condensed, and infiltrated with a mixture of pus and serum, which compressed the gullet to a very considerable degree. The mucous membrane of the larynx and trachea was found to be ulcerated, and, on the right side, the windpipe perforated by an oblique fistulous opening of considerable size. The patient died from a violent fit of coughing, the consequence of pus having passed into the windpipe.

Scrofulous
tumour.

Dr. Bailey has described a scrofulous swelling which appears to have been situated in the sub-mucous cellular membrane at the lower part of the pharynx. He says: “ It has occurred to me, to see a scrofulous swelling at the lower end of the pharynx, and the beginning of the œsophagus. When cut into, it appeared to consist of the same kind of

matter as a scrofulous absorbent gland. It grew on that side of the pharynx which is next the larynx; and the patient, for this reason, had not only lost almost entirely the power of swallowing, but was not able to speak, except in the slightest whisper."

The pharynx is liable to very few derangements from accidental injury, except such as may arise from the deglutition of noxious agents taken into the mouth. The effects of these are, the production of inflammation, or of eschar, if the agent has been very severe; as, for example, when sulphuric acid has been swallowed. They do not require any addition to the observations which I have already made respecting these parts: they afford, however, further illustration of the important difference which exists between the constitutional disturbance attending disease induced by accidental local injury, and that which accompanies disease set up by the system itself.

Accidental
injury.

The pharynx may be wounded by sharp instruments introduced through the mouth. This is the case, for a curative purpose, in operations on the tonsils: mischief may sometimes attend it. The carotid artery has been wounded through the tonsil, an unsuitable instrument having been employed in the operation. The pharynx is sometimes wounded when the throat is cut by the hands either of a suicide or an assassin. The pharynx has, I believe, been opened, by operation, for the extraction of foreign bodies, lodged in it, or in the œsophagus.

I have known a fatal result follow injury inflicted on the upper part of the pharynx without the employment of any cutting instrument:—a soldier was admitted into this hospital who had passed a considerable piece of lint up behind the velum palati, where it was completely concealed, being firmly lodged quite at the upper part of the pharynx: this circumstance was not discovered till the body was inspected: his symptoms had been, inflammation about one ear, and very severe cephalic and thoracic derangement.

Extensive phlebitis had been set up, affecting not only the veins of the neck, but the sinuses within the cranium.

OF THE ŒSOPHAGUS.

Structural
peculiarities.

Although the œsophagus resembles the mouth and the pharynx in being furnished with a cuticle, by which circumstance these parts are distinguished from the remaining parts of the alimentary canal, yet it requires to be considered separately from the mouth and pharynx, in consequence of some structural peculiarities, as well as on account of its derangements possessing a character of their own. In the first place, the form of the œsophagus is more simple than that of the parts which we have last considered, since it only consists of a simple cylindrical canal. Though liable to considerable and, sometimes, to injurious distension, from the too great size of bodies passing through it to the stomach, its movements and consequent alterations of form are inconsiderable, compared with those which take place in the mouth and pharynx. It is not unfrequently injured by the physical or chemical properties of the bodies which pass through it; yet it is in most of these respects less exposed than either the mouth or pharynx, excepting only those dangers which may arise from size and form. By its position, it is much more protected from any external violence than either of the parts before mentioned. The so-called muscular structure appended to the mucous membrane of the œsophagus is much more simple than that of the mouth and pharynx, since it consists only of longitudinal and circular fibres: their intimate structure is also distinct from that of the before-mentioned parts.—These fibres are pretty powerful in their contractile force, and keep the canal of the œsophagus nearly or quite closed, except when articles are passing through it. The mucous membrane is less distinctly elastic than that of the mouth and pharynx, being thrown into numerous plicæ, when its calibre is thus contracted. The muciparous glands are, for the most part,

of small size; so much so, indeed, that, when in a state of health, they may easily escape detection. It is therefore difficult to speak positively as to their number; yet, as far as we may conclude from what we see when these glands are enlarged by disease, or by their expelling their containing mucus after a short maceration in water, it would appear that they are not nearly so numerous as similar glands in some other parts of the canal. This smallness of the super-added glands must necessarily have the effect of leaving the surface of the membrane itself in a state to present a smooth and continuous surface to bodies passing over it; in which respect the œsophagus is not inferior to any other part of the canal. This must obviously be a most important advantage, by diminishing the liability to injury, especially when the character of the bodies occasionally passing through it is taken into account. The mucous membrane of the œsophagus has a more complete and distinct cellular membranous coat than any other part of the canal that we have hitherto considered. This circumstance, whilst it doubtless has its uses and advantages, perhaps, in securing the integrity of the part, may be regarded as one of the predisposing causes to the production of stricture of which we shall hereafter have to speak, as constituting the most important derangement to which this part is liable.

Deficiency of the œsophagus, like that of the mouth and pharynx, may concur with other malformations of the same class, in those monsters which are defective in the upper part of the body. A deficiency more especially affecting the alimentary canal, and particularly appertaining to the œsophagus, is seen in those cases in which the œsophagus is interrupted in its course, and presents two *culs-de-sac*, instead of forming a passage from the mouth to the stomach. This malformation, which is of rare occurrence, may be regarded as the counterpart to imperforate anus, and the termination of the intestine in a blind extremity; and conse-

Deficiency.

quently suggests considerations respecting the analogies to be drawn between both extremities of the alimentary canal, as well as respecting the views which I have already noticed with regard to the formation of the alimentary canal, from the umbilical vesicle.

An acquired deficiency in the œsophagus may take place, occasioning a permanent constriction, in some instances, almost amounting to obliteration, in consequence of the contraction following the inflammation of a part of the canal. A deficiency of a part of the œsophagus also exists where openings are formed between this canal and the trachea, or between the œsophagus and the cavities of abscesses formed in the neck, whether they communicate with the external integuments or not.

Excess.

A deviation from the normal state of the œsophagus, consisting in excess, is a still more rare occurrence than defect in this part: it is said, however, that the œsophagus is sometimes double, but I have never seen an instance of this form of monstrosity. It has been recorded, on the authority of Blaes.

Partial permanent distension of the œsophagus may take place around tumours developed in the œsophagus itself, or depending into it from the pharynx. The œsophagus may likewise be considerably dilated above the seat of stricture: a remarkable instance of this kind was sent to Dr. Monro, by Dr. Melville of St. Andrew's. He observes, that the enlargement above the stricture was so great, that the patient could retain nearly a pint of nutritious liquid, composed of eggs, milk and sugar, for ten minutes, conversing with his friends during that time.

Altered secretion.

There is but little opportunity for observing suppression or alteration of the secretions of the œsophagus; yet we can hardly doubt that the former takes place at the commencement of an attack of inflammation, and the latter, to a greater or less degree, in the course of it. The production

of a layer of lymph on the lining membrane of the œsophagus is spoken of as having been met with in a fatal case of acute inflammation of this part of the canal, in conjunction with pharyngitis.

Polypi sometimes grow from the mucous membrane of the œsophagus, but they appear to be less frequent than in the pharynx: they may be either of a non-malignant or of a malignant character. An account of a very remarkable polypus, which appears to have been of the former description, is given in Dr. Monro's *Morbid Anatomy*, p. 426:—

“ James Davidson, aged 68, was admitted into the Royal Infirmary, April 9, 1763, for the cure of a polypus in his throat. Upon examining his throat, there was nothing preternatural perceived; but on giving him a vomit, or irritating the fauces so as to make him retch, a large fleshy excrescence was thrown up into his mouth as far as his fore teeth, consisting of four different fangs, joined together by one common root. These were of a pretty firm fleshy texture, possessed of a good degree of elasticity. He could hardly allow them to remain half a minute in his mouth, as they shut up the larynx, and thereby entirely stopped his breathing. This polypus had for several years prevented him from swallowing any thing without much difficulty; neither could he breathe so freely, nor speak so distinctly, as usual: it likewise occasioned cough, which frequently forced the polypus into his mouth. On the 15th of May last, while Mr. Dallas attended the Infirmary, the result of a consultation was, that bronchotomy should be performed, to enable the patient to breathe by the opening made in the trachea, till such time as I should get a noose cast on the polypus. This method of cure, suggested by Dr. Monro, jun., was the most rational: for the extracting of it would have been improper, because the hæmorrhage could not have been stopped, besides the danger there was of pulling away the inner coat of the œsophagus. By means of a ligature passed through a hollow ring, to which a long stalk was connected, a large part of the tumour was removed, which was discharged by stool. The patient died in the Royal Infirmary, in April 1765; to which he had returned a few weeks before that, very feeble and emaciated; as for several months past he had not been able to swallow any solid food, and even swallowed fluids with much difficulty.

“The polypus had not, however, been seen by the surgeons who had examined his throat.

“On dissecting the body, the œsophagus was found to be greatly dilated by a very large fleshy excrescence or polypus, which grew out from its fore part, by a single root, about three inches lower than the glottis; but was split, at its under part, into several lobes, the largest and longest of which reached down to the upper orifice of the stomach. It is evident, that when, by the effort of vomiting, the polypus appeared in his mouth, its parts must have been inverted, or that the lobe which was longest, and generally undermost, had been thrown up into the mouth. And, as a certain proof that such inversion had actually happened, a cicatrice could be distinctly observed at the under end of the longest lobe, from which the four branches or fangs mentioned by Mr. Dallas had been cut off by the ligature he had applied. It is probable that the increase of the polypus during the two last years of the patient's life had prevented its inversion and appearance in the mouth, and, at the same time, added much to the difficulty of swallowing.”

Fungoid tumours growing from the mucous membrane itself acquire a somewhat elongated form, in consequence of the traction to which they are necessarily exposed: they are attached by a neck or peduncle, whilst they are extended and blunt at their free extremity. There are, generally, more than one growing from the same spot; and, as they may acquire considerable size, the bunch of pyriform bodies thus produced necessarily distend the œsophagus, displacing the larynx and trachea, and occasioning a swelling in the neck. In the case of malignant polypus in the œsophagus, which I formerly related, the upper part of the œsophagus was implicated in the production. This is, in fact, the most common seat of this and several other affections of the œsophagus. The adjoining mucous membrane of the œsophagus is apt to become ulcerated, and the disease may spread to the neighbouring textures. In consequence of this ulceration, or the softening of the malignant polypus itself, it may lose its attachment: and should it then be expelled by the mouth, it may not only be the means of

procuring temporary relief for the patient, but throw considerable light on the nature of his disease. Malignant polypi, in common with many other causes, must produce very serious impediment to deglutition; and, like them, may be taken for stricture of the œsophagus.

Idiopathic inflammation of the œsophagus is by no means a common occurrence. When it does take place, it is apt to be conjoined with inflammation of the pharynx. Deglutition becomes so extremely painful, that it is almost impracticable. The constitutional derangement which attends this inflammation is of a most severe character, and is generally quickly fatal. The most frequent causes of inflammation are those which arise from direct application of some powerful irritating agent; such as, scalding water, sulphuric acid, caustic, alkali, or the like. The effects of these agents upon the œsophagus are necessarily complicated with those which are produced in the stomach; and it is probable that the severe symptoms, and even fatal results, which generally follow, take place through the intervention of the stomach, rather than of the œsophagus. The effect of these irritants, when of great activity, is, to produce the separation of the cuticle; which hangs in loose and ragged shreds, leaving the inflamed membrane beneath entirely exposed. Sulphuric acid, and the other powerful escharotics, also cause the partial complete destruction of the mucous membrane itself.

Inflam-
tion.

Partial inflammation of the œsophagus sometimes takes place, the effects of which are seen in the production of ulceration. I have met with small, round, well-defined superficial ulcers in the œsophagus of a child.

Ulceration.

When ulcers in the œsophagus are deeper and larger, they produce difficulty of deglutition, and other symptoms nearly resembling those of stricture; from which, according to Sir Everard Home, they may be distinguished by the impression of the parts upon the extremity of the bougie introduced for the purpose of exploration. I must confess my scepticism with respect to the possibility of a diagnosis

being thus arrived at. Were the limits of the ulcer sufficiently defined and hard, and its depth sufficiently great to make any material alteration in the form of the bougie, I conceive that these impressions must be complicated with those produced by the contraction of the more healthy portion of the œsophagus immediately above. The character of the secretion left upon the instrument introduced, in making the examination, would, I conceive, throw much more important light upon the subject than any modification of form which the diseased parts could impress upon the bougie. Although ulcers in this part of the canal may be perfectly free from any thing like a malignant character, they must, notwithstanding, be attended with considerable difficulty of healing, in consequence of the motions of the part; which cannot fail to be sufficient for this purpose, whether deglutition be actually effected or merely attempted.

Cicatrized
ulcers.

When cicatrization is effected, it must have the effect of producing a partial constriction of the canal: first, from the natural tendency to contraction, which takes place in all cicatrices: 2dly, from the deficient extensibility of the cicatrized part, if not of the adjoining part also: and, 3dly, from the probable corrugation of the adjoining mucous membrane, which, as I remarked in my general observations on the derangements of the mucous membranes, are liable to be drawn together under favour of the laxity of the subjacent cellular membrane, to supply the place of loss of substance, from ulceration or other causes. This latter cause is not likely to occasion any serious inconvenience, unless the loss of substance of the membrane, and consequent corrugation or puckering of the surrounding portion, may be considerable. I suspect that a derangement of this kind may have taken place in a case alluded to by Dr. Baillie, in his work on Morbid Anatomy; unless the appearances which he has mentioned are to be wholly attributed to the alteration in the subjacent cellular

membrane. He says: "I once saw a very unusual stricture of the œsophagus. It consisted in its mucous membrane being puckered, so as to form a narrowness of the canal at a particular part, which would hardly allow a common garden-pea to pass. There was no appearance, however, of diseased structure in the mucous membrane which was so contracted, and the muscular part of the œsophagus surrounding it was perfectly sound. This disease was very slow in its progress; for the person in whom it took place had been for many years affected with a difficulty of swallowing, and could only swallow substances of an extremely small size."

Case.

The mucous membrane of the œsophagus may become the seat of malignant disease, without producing the large pyriform fungoid bodies which I have already spoken of as malignant polypi. Tolerably defined rounded spots, generally of small size, causing a partial thickening of the mucous membrane, occurring in a cluster, and having different degrees of firmness in different cases, form, I conceive, the early stage of malignant stricture of the œsophagus: at least I am induced to suppose so, from the appearance of the ulceration which I have observed when death has carried off the patient at a more advanced stage; in which state, ocular inspection is alone likely to be obtained. The subjacent cellular membrane sooner or later participates in the disease, either being destroyed by ulceration, or furnishing the bed in which new adventitious productions are formed. I shall therefore now proceed to speak of this subjacent cellular membrane.

Malignant
ulcers.

I am not aware of any striking cases of extensive inflammation of this tissue; but, from its general laxity, I should conceive it likely that it might be the seat of a greater or less degree of inflammatory œdema in conjunction with some forms of inflammation of the membrane covering it. Partial inflammation of this structure, induced by and accompanying that of the mucous membrane which covers it, appears to be the most frequent cause of permanent non-malignant stric-

Submucous
cellular
membrane.Inflamma-
tion.

Production
of stricture.

ture of the œsophagus: it is therefore worthy of particular attention. The product of inflammation may be something more than mere serum, especially if the primary lesion be of considerable duration—which we have seen to be by no means unlikely. It may possess more or less of the plastic character, and become a permanent addition to the natural structure, which it deprives of its cellular character. It then necessarily interferes with the dilatation of the part; and, what is of still more consequence, being subjected to the same tendencies to contract—on which I have so repeatedly insisted, as taking place in all instances in which effused lymph becomes a permanent structure; as is seen, for example, in the contraction of the cicatrices of burns, and in the contraction of the chest after pleurisy—it acts as a more or less tightly-drawn ligature round the œsophagus: in other words, a permanent stricture is formed, which is sometimes so complete, as scarcely to allow the passage of a small quill or probe.

Remarks
on the
treatment of
stricture.

Although it is my province to describe morbid appearances, rather than to speak of curative means, I cannot forbear making my protest against the employment of bougies in the treatment of stricture of the œsophagus. My objections are founded on the morbid anatomy of the parts concerned, and on the tendencies of the structures implicated in the disease. These objections not only apply to the use of bougies in cases of stricture of the œsophagus, but to all those cases in which instruments of the kind are used for the relief of strictures in any of the canals lined by mucous membrane.

The effect of inflammation of the submucous cellular membrane having been the deposition of plastic lymph—by which not only its bulk is increased, but its extensibility nearly or quite lost, and the calibre of the canal of which it forms a part is reduced—we find, on examining an œsophagus in this state, that, in conjunction with the appearances

which this description would indicate, that the mucous membrane is firmly and immoveably adherent to the subjacent coats. The altered cellular membrane has so far lost its natural appearance, as to merit the appellation of semi-cartilaginous, or even cartilaginous; which latter state Dr. Baillie notices, not on his own authority, but on that of some other pathologist.

If we reflect on what the operation of a bougie must be upon a mucous canal in the state which I have just described, we can scarcely believe it possible, even with the utmost care, to employ a smooth instrument, covered with some bland and lubricating material, that the mucous membrane can escape forcible compression from any effort to dilate the contracted canal. In fact, it must be compressed with something like a wedge, since the morbid thickening of the cellular membrane must be greatest somewhere near the middle of the thickened portion, and gradually diminish till it is lost in the healthy structure. Every repetition of the introduction of the instrument must renew the violence to the same part, since the mobility of the mucous membrane upon the subjacent coat is prevented. The effect of such repetitions of irritation can hardly fail to be the production of more or less inflammation, if not ulceration, of the mucous membrane. The subjacent structures must participate in this; the parts already thickened must become thicker and firmer; and the morbid alteration will be extended to portions of the cellular membrane which had hitherto escaped. Another effect to be dreaded from the operation of the bougie, is, that the violence which it thus inflicts may have a powerful influence in exciting the production of some scirrhus or fungoid growth; to which the œsophagus, when once it has become the subject of stricture, is peculiarly liable, probably in consequence of the natural movements of the part, which it is impossible entirely to suspend. These, however, must be innocent, compared with the passage of the bougie, and the efforts which the parts must

make to resist it. I am surprised that considerations similar to these which I just offered have not long since led to the entire proscription of the use of the bougie in cases of stricture of the œsophagus, if not of those of the rectum and urethra. It is possible, however, that the operator may have been beguiled, by a temporary seeming advantage, into commendation of his efforts. The muscular resistance to the instrument will diminish as the parts become accustomed to its contact, and even a slight dilatation of the strictured part may sometimes have been effected; but, from the nature of the structures concerned, this advantage can only be transient, since the parts will not only tend to return to their former condition, but the successive additional deposits of lymph must eventually increase the extent and tightness of the stricture. I believe, also, that it is by no means improbable that the use of bougies may have been suggested and supported by an analogy drawn between living and inert matter; and the very application of the term '*chirurgie*' to this mode of treatment suggests a resemblance to the efforts of a hosier to dilate the tight finger of a glove. To the objections which I have just urged against the use of bougies for strictures of the œsophagus—which apply to those cases in which the stricture depends on thickening and contraction of the submucous cellular membrane, and in which the treatment would alone seem applicable—may be added the danger of employing the bougie in other cases in which it would be quite inadmissible. I have already remarked, that the symptoms of stricture of the œsophagus may proceed from other causes besides that which I have been last considering; and it may be well to enumerate them here, with reference to the injury which may be done by the passage of a bougie.

First—There may be no stricture in the œsophagus; and the difficulty of deglutition may arise from disease in the trachea, which, we have seen, has a tendency to propagate itself to the œsophagus: the passage of the bougie might,

nevertheless, be interrupted by the spasmodic constriction which its presence would excite, and stricture might thus be simulated. The repeated application of the bougie in these cases would only aggravate the disease, and hasten the period at which the œsophagus would really participate in it.

Secondly—Ulceration in the œsophagus produces symptoms in almost every respect resembling those of simple stricture; and although there may, at times, be others to lead to correct diagnosis, there is no inconsiderable danger of their being overlooked, or not sufficiently marked to lead to the distinction, before much mischief may have been effected by the bougie.

Thirdly—I have already noticed the probability of the employment of a bougie favouring the production of disease of a malignant character. When the stricture of the œsophagus is already of a malignant description, there can be no doubt that the use of the bougie must tend materially to aggravate the disease, and accelerate the perforation of neighbouring parts; which, in fact, would not be unlikely to take place during the employment of the bougie; the instrument completing what disease may have all but effected.

Fourthly—Where the impediment to the passage of food through the œsophagus is occasioned by the pressure of neighbouring tumors, whether resulting from adventitious structures or from the derangement of those natural to the body, it is very evident that the passage of a bougie could effect no good purpose; but, on the contrary, much mischief might be done, by injury to the mucous membrane and subjacent coats. Such a case, provided the tumor were not perceptible externally, might, I conceive, be easily taken for simple stricture, and be treated with a bougie, with all the activity and perseverance which the ascertained integrity of the mucous membrane would seem to sanction.

OF MALIGNANT STRICTURE OF THE ŒSOPHAGUS.

Loss of substance in malignant disease of the Œsophagus.

Although I have already spoken of malignant disease of the mucous membrane of the Œsophagus, the effect of which must necessarily be to diminish the calibre of the canal and interfere with the passage of food through it, and therefore to produce one of the forms of malignant strictures of the Œsophagus, yet I have preferred reserving the observations which I have to offer under this head for the present occasion; since I believe that it very generally happens that the submucous cellular membrane is essentially involved in the affection. Malignant disease of the Œsophagus, producing symptoms of stricture, like cancer of the lips and of the os uteri, is often quite as remarkable for loss of substance as for the production of adventitious structure; nevertheless, I have repeatedly observed that the latter really takes place. On close examination of the ulcer, we may generally find about the edges, and slightly elevating the mucous membrane, a small deposit of adventitious matter, sometimes extremely soft, and of an opaque whitish colour, somewhat resembling stationer's paste; but which, nevertheless, if the structure has not been completely broken down, exhibits sufficiently evident traces of the mode of formation dependent on the production of cysts, the characters of which I have already amply detailed. There can be little doubt, then, notwithstanding the small amount of adventitious deposit, that the Œsophagus has, in these cases, really been affected with fungoid disease, in that form to which the term 'cerebriform cancer' has been applied, and which is apt to invade other parts of the alimentary canal besides the Œsophagus. Such deposits, from their whiteness and soft texture, have received from Dr. Monro the appellation of "milk-like tumor."

The ulceration attending malignant disease in the Œsophagus spreads along the membrane itself, so as sometimes to occupy a considerable extent. It also penetrates to the

subjacent structures; and, having perforated the coats of the œsophagus, effects a communication with the trachea, or with the substance of the lungs. In this latter case, I have known it produce extensive gangrene of the pulmonary texture. It may likewise take other directions; but, as it is not very likely to perforate any of the large vessels, and its precise extent in the cellular membrane of the mediastinum not being very important, its ravages in other directions have been less distinctly noted. It perhaps more frequently happens that the patient is cut off before the disease has spread by ulceration to other parts; nevertheless, the disease may not be strictly confined to the œsophagus. I have seen small scirrhous tubercles scattered in the cellular membrane about the trachea, and between it and the œsophagus.

Extension of
the disease
to other
parts.

I have not sufficiently numerous data before me, to warrant any conclusion respecting the remote parts of the system in which connection with the œsophagus by the obscure medium of sympathy is indicated by their simultaneously suffering from malignant disease; but I have remarked, in two females whom I have inspected, after death from stricture of the œsophagus, that one or more scirrhous tubercles were developed in the uterus.

OF THE CONTRACTILE FIBROUS COAT OF THE ŒSOPHAGUS.

Although the morbid appearances connected with this part of the tube are neither numerous nor very important, I must not pass it over without a few observations: and in the first place, I must call your attention to its general anatomical characters. Like the muscular coat, as it is called, of most other parts of the alimentary canal, it consists of a double layer of fibres; of which the inner is annular and extremely thin, the outer longitudinal, and considerably thicker: these two coats are intimately united to each other, the cellular membrane between them being so thin as not to merit being distinguished as a coat. The nature of

Its anatomical
character.

the fibres of that which is commonly called 'the muscular structure of the œsophagus' deserves some attention. You will doubtless remember, that, in my general remarks upon the mucous membranes, I observed that one of the appendages to the most perfectly furnished membranes of this class consists in a layer of contractile fibres, generally described as muscular, but which, from essential differences in their functions, and more especially from their striking want of similarity in structure, as made known by the help of the microscope, it is absolutely impossible correctly to class with the muscles, properly so called. This statement I confirmed by the result of the microscopic examination of this coat, in the intestines, the bladder, and the uterus. With respect to the œsophagus, it might still be questioned, whether its contractile coat belongs to the class of fibres of which I have just been speaking, or to the more strictly muscular tissue with which there can be no doubt that the pharynx is provided. Its immediate connection with this part, its possession of a cuticle in common, not only with the pharynx but with the mouth, both of which possess a strictly muscular coat, might induce one to suspect that the œsophagus was similarly circumstanced. Its being situated, like them, above the diaphragm, might be urged as another feature of resemblance. In opposition to this presumptive evidence in favour of the œsophagus being furnished with a decidedly muscular coat, it must be remembered, that whereas the pharynx is provided with muscles having in themselves evidently the character of all strictly muscular fibres, and like them consisting of symmetrical pairs, in the œsophagus, we first perceive the absence of this symmetry, and the appearance of a double layer of fibres essentially connected with the membrane itself.

I am disposed to regard, as a more conclusive evidence of the absolute similarity of this coat of œsophagus to the corresponding coat in the subsequent parts of the canal, the fact, that, notwithstanding its fleshy appearance, its fibres,

when seen through the microscope, present no trace of that appearance of transverse striæ which is exclusively met with in confessedly muscular fibres; and that it does not, when very thinly extended, moistened, and compressed, exhibit the perfect nacreous lustre which, under these circumstances, I have invariably observed to be distinctly visible in genuine muscle. These concurrent circumstances induce me to regard the contractile fibrous coat of the œsophagus as consisting of the same structure as the contractile fibrous coat of the stomach, intestines, bladder, and uterus.

This coat is connected with the mucous membrane, by the submucous cellular membrane of which I have already spoken. This cellular membrane may, however, be regarded as constituting two coats. In the healthy state, that portion which is immediately subjacent to the mucous membrane is extremely lax, allowing great extent and freedom of motion. This circumstance must greatly diminish the liability of the mucous membrane to be injured by hard and rough bodies passing through it. That portion of cellular membrane, on the contrary, which is next to the contractile fibrous coat is of a dense and compact character, forming a kind of fascia of pretty uniform thickness. I conceive that this arrangement must have an important influence in preventing the mucous membrane from being forced in pouches through the separated fibres of the contractile coat, as we see to be not unfrequently the case with the mucous membrane of the bladder, and which we might not unreasonably infer, *à priori*, would be peculiarly likely to occur in the œsophagus, from the nature of the bodies which are liable to pass through it, unless there was some special provision against this accident, such as I conceive is to be found in the layer of condensed cellular membrane of which I have just spoken.

Anatomical character of the subjacent cellular membranous coat.

Its use.

The principal morbid conditions of this contractile coat are, its partial and irregular action, producing what is called spasmodic stricture of the œsophagus; and a general defi-

Spasmodic stricture.

Deficient
power, term-
ed paralysis.

ciency of its contractile power, constituting what is called 'paralysis of the œsophagus.' I am not aware of this coat ever becoming generally or partially reduced in thickness to a degree sufficient to produce inconvenience, or even to attract attention; and, on the other hand, it seldom becomes preternaturally thickened from the influence of increased action. In cases of stricture, it might be supposed that such a change would take place above the contracted spot; yet I cannot remember to have ever seen this effect produced. I conceive that this circumstance is not to be attributed to any peculiarity in the contractile coat of the œsophagus; but rather to the fact, that those who are labouring under stricture of this canal are extremely careful to accommodate their ingesta to the state of the diseased part. The contractile coat of the œsophagus is liable to participate in disease propagated to it from neighbouring parts: thus, it may be perforated by ulceration, either of the common or of the malignant character: we see instances of the former in the communication which is sometimes formed between the ulcerated trachea and the œsophagus; in the opening of abscess in the neck into this canal; and also in the bursting of aneurisms into the œsophagus, which is an event of no rare occurrence. By malignant ulceration, extensive destruction of this as well as the other coats may be produced. I cannot remember that I have ever seen in the œsophagus that partial thickening of the contractile fibrous coat which, in other parts of the canal, and more especially in the stomach, is apt to take place where malignant disease exists; and which has been described as hypertrophy, although it is essentially distinct from the absolute hypertrophy induced by increased exertion of its function.

Disease in
other tex-
tures propa-
gated to this.

LECTURE XIX.

ON THE MUCOUS MEMBRANES.

THE STOMACH.

DIFFICULTY OF FIXING THE LIMIT BETWEEN HEALTH AND DISEASE IN THIS ORGAN —DIFFERENCES DEPENDENT ON THE STATE OF DIGESTION—ON THE HABITUAL FOOD—ON DISTURBANCE OF THE DIGESTIVE PROCESS—OPINION OF BILLARD, RESPECTING THE NORMAL COLOUR OF THE STOMACH—OF HABICOT, SABATIER, PORTAL, BUISSON, GAVARD, BOYER, CHAUSSIER AND ADELON, HIPPOLYTE CLOQUET, MARJOLIN, J. F. MECKEL, ROUSSEAU — DIFFERENCE BETWEEN THE STATES OF REST AND OF ACTIVE DIGESTION—COLOUR IN INFANCY AND IN ADVANCED AGE—DIFFERENCES IN SURFACE AND TEXTURE—HEALTHY SURFACE—NOT STRICTLY VILLOUS—CHARACTER OF THE CAPILLARY VESSELS—NATURAL INEQUALITIES OF SURFACE—THICKNESS AND TENACITY—SECRECTIONS OF THE STOMACH—CHEMICAL PROPERTIES VARY—DEPRAVED SECRECTIONS—AUGMENTED—ABUNDANT AND WATERY—BLOOD EFFUSED—SECRETION, BROWN, BLACK, OR GREEN—DEFICIENCY OF THE STOMACH—STOMACH PRETERNATURALLY CONTRACTED—PARTIAL DEFICIENCY—PARTIAL DEFICIENCY FROM DESTRUCTION—EXCESS—DILATED IN POUCHES—PRETERNATURAL THICKNESS OF THE MUCOUS MEMBRANE, OR HYPERTROPHY—ÉTAT MAMELONNÉ OF LOUIS—EXPLANATION OF THIS STATE—FUNGUS CONDITION—POLYPI OF THE STOMACH—CASE—APPEARANCES PRODUCED BY INFLAMMATION—FIRST EFFECT OF IRRITATION—APPEARANCE OF THE RECENTLY INFLAMED STOMACH—INTENSE INFLAMMATION—SECRETION PLASTIC, OR OTHERWISE ALTERED—RARITY OF ACUTE GASTRITIS: BROUSSAIS, FODERA, PROST, BAGLIVI, STOL, FRANK, CURRY—CHRONIC INFLAMMATION—SECRETION ALTERED, ABUNDANT, GLAIRY, VISCID, THICK, OF LESS TRANSPARENCY, PURIFORM—STATE OF THE MEMBRANE, THICKENED, SOFTENED, DENSE, OR FIRM BUT FRIABLE—BLOODY POINTS—APPEARANCES TO BE DISTINGUISHED FROM INFLAMMATION—CONGESTION—CADAVERIC CHANGES—INFLUENTIAL CAUSES, DISEASES OF THE HEART—ASPHYXIA—PHYSIOLOGICAL OR HABITUAL LIABILITY TO DETERMINATION OF BLOOD—INFLUENCE OF NEIGHBOURING PARTS—DISTINCTIVE CHARACTERS—SEMBLANCE OF INFLAMMATION ACCIDENTALLY PRODUCED—REDNESS PRODUCED BY EXPOSURE TO THE AIR—BROWN DISCOLOURATION OF THE MUCOUS MEMBRANE NOT A PROOF OF CHRONIC INFLAMMATION—GREY OR SLATE COLOUR—ULCERATION OF THE STOMACH—MALIGNANT DISEASE AFFECTING THE MUCOUS MEMBRANE—OF THE MUCIPAROUS GLANDS OF THE STOMACH—QUESTION AS TO THE EXISTENCE OF THESE BODIES—SOME APPEARANCES MISTAKEN FOR FOLLICLES—REASONS FOR ADMITTING THEIR EXISTENCE—THEIR PROBABLE CHARACTER, POSSIBLY OF MORE THAN ONE KIND—OF THE SUBMUCOUS CELLULAR MEMBRANE OF THE STOMACH—ANATOMICAL CHARACTERS—EMPHYSEMA—CEDEMA—INFLAMMATORY, AND NOT INFLAMMATORY—INFLAMMATION, PLASTIC, PARTIAL IN HOUR-GLASS CONTRACTION—DIFFUSED—MEMBRANE THICKENED, INDURATED, SOFTENED—QUESTION RESPECTING THE CONTINUANCE OF INFLAM-

MATION IN THE CELLULAR MEMBRANE, WHEN SUBSIDED IN THE MUCOUS—THE SEAT OF ADVENTITIOUS GROWTHS—ANALOGOUS, FAT, ENCYSTED COLLECTIONS OF FAT AND HAIR—HETEROLOGOUS, MALIGNANT OF SEVERAL VARIETIES—PROGRESS OF THE DISEASE WHEN COMMENCING IN THIS STRUCTURE—THE MILT-LIKE TUMOUR OF DR. MONRO—DR. MONRO'S DESCRIPTION.—REMARKS ON MALIGNANT DISEASE OF THE STOMACH—CONTRACTILE FIBROUS COAT—LITTLE LIABLE TO DISEASE—REMARKS RESPECTING THIS COAT—HOUR-GLASS CONTRACTION OF THE STOMACH—DEFICIENCY OR THINNESS OF THE CONTRACTILE COAT—THICKNESS OR HYPERTROPHY—PARTIAL THICKENING AT AND NEAR THE PYLORUS—THICKENING FROM INFILTRATION OF A MALIGNANT CHARACTER—EFFECTS OF ACCIDENTAL INJURY—OF POISONS TAKEN INTO THE STOMACH—PRELIMINARY CONSIDERATIONS—EXPERIMENTS ON INFERIOR ANIMALS—DESCRIPTION OF THE HORSE'S STOMACH—OF THE MODUS OPERANDI OF POISONS—REFERENCE TO THE LABOURS OF ADDISON AND MORGAN—DISTINCTION TO BE MADE BETWEEN THE SPECIFIC EFFECTS OF THE POISON AND THE PECULIAR SYMPATHIES OF THE ORGAN—EXPERIMENT WITH HOT WATER ON THE STOMACH OF A DOG—INFERENCES TO BE DRAWN FROM THE SITUATION OF THE PRINCIPAL LESION OF THE STOMACH IN CASES OF POISONING.—THE PART FIRST AND MOST EXPOSED TO FLUIDS—POISONS TAKEN IN SUBSTANCE—POISONS TAKEN IN SOLUTION—CHARACTER OF THE SECRETION OF THE MUCOUS MEMBRANE—EXTRAVASATION OF BLOOD OF TWO KINDS—ILLUSTRATIVE CASES AND EXPERIMENTS—TWO CASES OF POISONING WITH ARSENIC—EXPERIMENT ON A DOG WITH ARSENIC—EXPERIMENTS ON HORSES WITH ARSENIC—EXPERIMENT ON A HORSE WITH CORROSIVE SUBLIMATE—EXPERIMENT ON A DOG WITH OXALIC ACID—REMARKS ON THE EFFECTS OF ACIDS—EXPERIMENT ON A DOG WITH ARDENT SPIRIT—WOUNDS OF THE STOMACH—REMARKS—CASES.

GENTLEMEN—

Difficulty of fixing the limit between health and disease in this organ.

It may, I believe, safely be said, that there is no part of the system, the various appearances of which, both in health and in disease, it is of more vital importance duly to appreciate than those of the stomach;—and there is certainly none of which they are involved in so many difficulties. It is obvious, that before we can pronounce positively with respect to the morbid character of the different appearances which offer themselves to our observation, it is absolutely necessary that we should be acquainted with the boundaries of health and disease. Now, there is no other organ with respect to which it is so difficult to fix these boundaries, as the stomach. This arises, not only from the texture and position of the stomach, which cause its appearances to be greatly modified by the state of the system at or near the time of death, and by cadaveric changes which succeed it,

but also by the varying activity of the organ itself, according as digestion is going forward or not. In considering the former of these states, some modification of appearances must unquestionably be assigned to the influence of the different kinds of aliments undergoing the digestive process. Again: whether digestion is going forward or not, we must be prepared to estimate differences of a more permanent character dependent on the habits of the individual, as respects the quality and quantity of the aliment on which he has required his stomach to operate. It was shewn by John Hunter, that, by education, the sheep might be made a carnivorous, and the eagle an exclusively vegetable feeder. Such alterations in the habits of these animals effected, as might have been expected, a remarkable change in their stomachs. I cannot doubt, that, in like manner, the stomachs of human beings must be very materially modified by the kind of food upon which they are habitually called upon to act: nor are these differences the less important, from the infinite variety which they must exhibit, in accordance with equal variety in our mode of living. The difficulty of duly appreciating these differences is, at least, as great as their importance. It is obviously manifest, that as most persons are mixed feeders, and by no means uniform in the mixtures which they employ, it must be extremely difficult to trace the influence of particular kinds of food: and, moreover, the different digestive powers of different individuals let in another important element, still further to complicate this already intricate question. The man of feeble digestive powers, who habitually errs as to the quantity and quality of his food, must have his stomach not only modified by the influence of his predominant article of diet, but his food itself, by undergoing its changes in an unhealthy manner, must become an habitual cause of morbid, instead of healthy irritation. We have thus a new difficulty introduced, with respect to the limits which are to be drawn between those appearances which are healthy and those which are morbid.

Differences
dependent
on the state
of digestion:

on the habi-
tual food:

on distur-
bance of the
digestive
process.

I am not aware that any one has attempted to remove these difficulties, depending on the variety in the appearances of the stomach, arising from the influence of diet, and perfectly consistent with health: nevertheless, it is absolutely essential that these difficulties should be removed, before our acquaintance with the morbid appearances of the stomach can be complete and satisfactory. Whilst I am induced to make this confession, with respect to myself and others who have paid attention to the morbid anatomy of the alimentary canal, and to express the hope that future pathologists may so combine their investigations as to throw that light upon the subject which it is scarcely possible for a single individual to do, I must also state, that, notwithstanding the very serious difficulties and deficiencies to which I have alluded, many valuable observations and much important knowledge have been obtained respecting the pathological appearances of the stomach, as well as of the succeeding portions of the alimentary canal. That which is established I must endeavour to lay before you, as such; and the very expression of doubt respecting those points where uncertainty is at present inevitable may not be without its use. With reference to this portion of morbid anatomy, I must particularly recommend to your attention the admirable work of Billard on the Mucous Membrane of the Stomach and Intestines, in the states of health and inflammation.

Had not an untimely death cut off this promising young man, there can be little doubt that his zeal, perseverance, and powers of accurate observation and description, would have conferred important benefits on our profession. In the course of my inspections, I believe that I have met with parallels to most, if not all, the observations which he has recorded. There is likewise a conviction of truth produced on the mind by the admirably graphic mode in which he has detailed them. In the works of Louis and Andral you will also find many very important observations connected with our present subject.

The natural healthy colour of the mucous membrane of the stomach, when not in the state of excitement which attends digestion, and when no particular circumstances have occurred at or near the time of death, is stated by Billard, as the result of particular inquiry directed to this point, to be a dead milky white: it has, however, been differently described by other anatomists, who, though their names carry weight, do not, I conceive, in this particular respect, merit all the confidence I am disposed to place in the description of Billard.

Opinion of
Billard re-
specting the
normal
colour of the
stomach:

Habicot, a celebrated ancient surgeon of Paris, describes the colour of the internal surface of the stomach as a dull purple. Sabatier describes it as of a reddish purple colour. Portal, without expressly stating the natural colour, has justly remarked, that the dark discolouration, which is sometimes met with, is not always to be regarded as an indication of inflammation or excitement, but may merely be the effect of congestion.

of Habicot,
Sabatier,
Portal,

It was the opinion of Buisson, as stated in Bichat's Descriptive Anatomy, that the lining membrane of the stomach is red throughout. Gavard merely says, that the stomach is internally grey, approaching to red; that, in inflammatory conditions of the stomach, this colour becomes more intense; but that it changes to a blackish brown, when these affections pass into gangrene, or when the membrane has been subjected to the action of corrosive poisons. Boyer makes the mucous membrane of the stomach of a grey colour, approaching to yellow and red, but admits that there are great varieties in this respect. Chaussier and Adelon have also described the internal surface of the stomach as of a reddish-grey colour; but at the same time observe, that it is extremely variable.

Buisson,
Gavard,
Boyer,
Chaussier
and Adelon,

Hippolyte Cloquet makes the mucous membrane of the stomach of a reddish-white colour, somewhat mottled. Professor Marjolin has expressed the same opinion; but also mentions, that black and brown stains are met with,

Hippolyte
Cloquet,
Marjolin.

J. F. Meckel, without any alteration of structure. J. F. Meckel says, that the stomach is almost always, shortly after death, tinged with a yellowish, brownish, or reddish colour; but that it is by no means uncommon to find it partially strongly coloured with red, from a net-work of fine vessels almost exclusively venous.

Rousseau. The attention of the medical profession in France had for several years been especially directed, by the doctrines of Broussais, to the various conditions of the mucous membrane of the stomach, when Rousseau instituted a careful inquiry, in order to ascertain the precise appearance presented by the stomach when perfectly free from the influences of disease. For this purpose, he examined the bodies of criminals who died by the hands of the executioner (taking care to ascertain that they were in health at the time). As the result of this inquiry, he states, that the colour of the gastro-intestinal canal is white, or white faintly tinged with red. In this remark he is borne out by Billard; but he does not mention the circumstances under which it assumes the one of these colours, in preference to the other.

I must not, however, omit to observe, on behalf of Rousseau, that his Memoir appeared as a posthumous publication. He was a pupil under Laennec, when I first visited Paris: and it affords me a sort of melancholy pleasure, whilst I bear my testimony to the ardour with which he pursued his medical studies, also, to acknowledge the kind attentions which, as a foreigner, I received at his hands. Had he not been cut off by an untimely death, he might probably have made those distinctions which Billard (who confirms his general accuracy) has had the merit of introducing. Billard has very satisfactorily shewn, that the pale, or rather white colour of the healthy mucous membrane of the stomach is that which belongs to it in the intervals during which digestion is not going forward.

If the stomach happen a short time before death to have received a meal, the mucous membrane, although in a perfect

state of health, instead of white, exhibits a delicate and diffused light rose-red colour. The fact, that digestion was going forward at the time of death, is proved, if the interval between death and examination be not too considerable, by the very peculiar odour which exhales from the opened stomach. This odour is not merely that of the ingesta themselves; but there is a superadded odour, which, be that of the ingesta what it may, not merely unites with it, but very much predominates over it. Both the white of the healthy but inactive stomach, and the light rose-red of an equally healthy stomach carrying on the process of digestion, may be variously modified by causes which I shall hereafter explain, without such modification of colour being a token of disease existing in the stomach at the time of death.

Difference between the state of rest and of active digestion.

About the period of birth, the mucous membrane of the stomach is of a light rose colour, not altogether unlike that which at a later period attends digestion. Advanced age, as Billard has also shewn, induces another modification, even of the healthy stomach: it is often of a light ash colour.

Colour in infancy and in advanced age.

The surface of the mucous membrane of the stomach, as respects form, and the thickness and firmness of its substance, are of equal importance with its colour; but they are points on which it is quite as difficult to make the distinction between health and disease. Not merely, as I am persuaded, must a range be allowed, in both these respects, to the healthy condition of the stomach, in consequence of differences which may exist between the stomachs of different individuals in perfect health, but causes, in themselves trivial and totally independent of disease, may occasion differences in this respect, dependent on the condition of the stomach as to distension or contraction, by which the thickness and surface of the mucous membrane must be influenced.

Difference in surface and in texture.

The internal surface of the stomach, where not thrown into folds by the contraction of what is called the muscular

Healthy
surfaces

not strictly
villous.

coat, presents a smooth and even surface, upon which, under favour of the lubricating mucus, the finger may pass without meeting with any sensible inequalities. If, however, the mucus be carefully wiped off, and its place supplied by a little clear transparent water, we may observe, upon close inspection, either with or without the assistance of a lens, that this surface, notwithstanding the idea of smoothness and evenness which is suggested through the medium of the sense of touch, is very different, not only from the smooth and polished surface of the serous membranes, but also from that of those mucous membranes which are furnished with a cuticle or epithelium. In fact, the surface of the mucous membrane of the stomach is generally described as villous; and even Billard appears to agree with this description of it. I have, however, at least a doubt respecting the accuracy of this statement. To me, the surface of the stomach, when viewed under the circumstances which I have mentioned, appears, to the naked eye, by no means perfectly smooth, but of an indeterminate character, very difficult to describe.

Whilst in the serous membranes the assistance of a powerful microscope enables us to distinguish delicate fibres intimately interlaced, when the mucous membrane of the stomach is thus examined, I can only observe an amorphous semi-transparent mass, in which no structural texture can be distinguished. There is, therefore, little to be expected from this mode of examination: yet I do not consider that it is yet to be wholly abandoned. When immersed in water, and in a perfectly recent state, it becomes, apparently, slightly thickened; but when gently pressed between the fingers, the water is displaced, and resumes at least its previous thinness; which seems to indicate, that the water had penetrated a sort of areolar or spongy texture, but had not intimately combined with it, as with mucus itself, or with some other aqueous secretions. In some states of the stomach, of which I shall have more particularly to speak hereafter, the mucous membrane becomes injected; and

some idea of the character of the texture in which the vessels ramify may be formed from the appearance which they exhibit when thus rendered visible. It not unfrequently happens that this injection is neither intense nor universal: hence the vessels may be traced, without confusion, with the assistance of a lens, or even with the naked eye. They exhibit a character which may not inaptly be styled dendritic, since they closely resemble the marks in mocha-stone, to which mineralogists have applied the same epithet, in consequence of their suggesting the idea of a tree.

I think that this resemblance to the spots in mocha-stone is most striking when small and partial arborisations are viewed with the naked eye. When viewed through a lens, they more nearly resemble some small and delicate sea-weeds which we occasionally see spread upon paper. These injected capillaries in the mucous membrane of the stomach are neither so minute and delicate; nor have they so well-defined, even, or clean (if I may so describe it) an outline as the vessels which we may see ramifying through parts having a more firm and definite texture; as, for example, beneath the surface of the serous membranes, or in the completely formed and perfectly cellular-membranous adhesions which inflammation is apt to super-add to them. In fact, the vessels in the mucous membrane of the stomach, of which I am now speaking, bear a very close resemblance to the early attempts at organization which we may perceive in the recent false membranes upon the surface of inflamed serous-membranes, before they have lost the character of coagulable lymph. The cause appears to be the same in both instances. The imperfect vessels ramify through a soft and scarcely-concrete substance, by which they are fully supported: they consequently become more dilated than the minute branches from which they proceed.

Character of
the capillary
vessels.

The mucous membrane, whilst presenting a surface of the character which I have just described, is not perfectly even and level. When laid upon a flat surface, with its free

Natural in-
equalities of
surface.

surface uppermost, we may generally, if not always, perceive very slight undulations of small extent, and little elevation; such as, at times, to require a particular direction of the light, to make them visible. In figure, they bear some resemblance to the section of the acini of the liver, when they are affected by hypertrophy. The elevated spots do not seem to possess any determinate arrangement, and appear, for the most part, to be continuous, yet in such a manner as variously to circumscribe the corresponding slight depressions, which are likewise of irregular figure, though generally somewhat oblong. They are much less than the elevations, and are more nearly linear.

The extent of the elevations, like their figure, is irregular; but they may, for the most part, be described as varying in size, from a grain of linseed to that of a smallish grain of rice. This comparison, however, whilst pretty accurately indicating their extent, would give an erroneous idea respecting their elevation, if taken as the measure of this also, which, as I have before remarked, is so trifling as to be scarcely perceptible.

Thickness,
and tenacity.

I have been thus particular in describing the surface of the mucous membrane of the stomach, believing that a correct knowledge of this will render the deviation from the normal state, in this respect, more intelligible. The thickness and firmness, or tenacity, of the mucous membrane also require attention; since, in these respects, it presents differences which must be regarded as the result of disease. The resistance of the mucous membrane after death is by no means considerable, even when the stomach is not in a state of disease; and it scarcely needs a cutting instrument for division, the finger-nail being mostly adequate to penetrate it. Its thickness is generally influenced by the state of the stomach, as to contraction or distension. In health, it is neither, in any part, nor under any circumstances, so little as a hundredth, nor so much as a tenth, of an inch in thickness.

Under favour of the laxity of the subjacent cellular membrane, the mucous membrane may be stripped off in portions, varying in size, according to the tenacity of the mucous membrane, and the laxity and tenderness of the cellular membrane. This circumstance affords a test, which is frequently and usefully resorted to, to ascertain the condition of the mucous membrane. In the healthy state, a shred of mucous membrane, about an inch in length, and half as wide, may frequently be stripped off. This, when stretched upon the finger, is so thin and transparent, as scarcely to conceal the skin beneath. Billard says, that the finger is about as much concealed as if a piece of crape were stretched over it. The firmness and tenacity of the mucous membrane of the stomach may be modified by other causes besides those which specially relate to the stomach itself, and of which I shall have to speak more particularly. There are some subjects, which, even before animal heat is extinct, exhibit a tenderness or lacerability of nearly all the structures; so much so, that they may be divided without the use of a cutting instrument. The mucous membrane of the stomach fully participates in this state, and considerable portions may then be scraped off by the back of the scalpel; but though the subjacent coat may be thus denuded to a considerable extent, the mucous membrane detached from it does not form a coherent continuous shred, but is almost broken up into a pulpy mass.

OF THE SECRETIONS OF THE STOMACH.

In the healthy state of the stomach, its mucous membrane is bathed with rather a large quantity of mucus, which is generally very viscid, and semi-transparent: it appears to be the production of the entire surface of the mucous membrane; yet it is probable that it is not produced equally copiously from all parts. Without the influence of disease, it varies considerably, as to its physical properties, at different times. When digestion is not going forward,

Chemical
properties
vary.

and the stomach is in a quiescent state, the mucus is probably of an uncertain character, possessing no remarkable properties of its own, but somewhat modified by those of the latest contents of the stomach. During digestion, it becomes possessed of very remarkable properties. It exhales a peculiar, sub-acid, faint odour. It has a very considerable power of solution, which acts upon almost all dead animal substances. It is agreed, I believe, by all good chemists who have examined this important secretion, that the acid so produced is the secretion from the mucous membrane of the stomach, as shewn by an experiment of Prevost and Dumas. They placed some soft material, saturated with a blue vegetable infusion, in contact with the mucous membrane of a stomach which was in the height of its digestive activity: they discovered, not only that the secretion transuding from the surface of the stomach changed the infusion from blue to red, but that the production of this acid was much more considerable in some parts of the stomach than in others, and that it was towards the cardiac extremity that the greatest activity prevailed. It has been stated, by some excellent chemists, that the acidity of the secretion from the stomach depends upon a small quantity of free muriatic acid: others, however, conceive that the acid secreted by the stomach is altogether peculiar.

Depraved
secretions:

When the state of the stomach is considerably disordered, the quantity of acid secreted by the stomach, even when digestion is not going forward, is sometimes very copious, and so intense as to produce an unpleasant effect in the mouth. If rejected, and thrown upon some earthy or alkaline carbonate, it produces an active effervescence. Other tastes besides acid, such as bitter or mawkish sweet, probably depend on ingesta either too long retained in the stomach, or which do not undergo that process in a perfectly healthy manner; or on bile regurgitating from the duodenum into the stomach. I am not aware that the absolute deficiency of the mucous secretion of the stomach has ever taken

place. The reverse of this is by no means unfrequent; and the production of redundant ropy mucus is sometimes one of the most troublesome symptoms of the dyspeptic patient, who rejects it with much painful retching. There is another form of depraved secretion from the stomach, attended with redundancy of the fluid part, whilst the proportion of mucus seems to be rather deficient than otherwise: I allude to the colourless and nearly tasteless watery fluid thrown up from time to time, after the endurance of pain, by those who are labouring under that form of dyspepsia which is known by the name of pyrosis. Sometimes blood is more or less copiously poured out from the mucous membrane of the stomach, and, being rejected by the mouth, constitutes the symptom designated by the term 'hæmatemesis.' At other times, the secretions of the stomach are rejected, of various shades of brown, and even nearly or quite black: all of these may be produced by effused and variously-altered portions of blood escaping from the mucous membrane of the stomach itself. They may, however, be occasioned by matter regurgitating from the duodenum; as is certainly the case with the green and yellow colours not unfrequently presented by matters rejected from the stomach. Though most of the varieties in the secretion of the stomach, which I have mentioned, may, I believe, be frequently met with in conjunction with a more or less evident derangement of the mucous membrane itself, yet, with one or two exceptions, I am not aware that they can be ascribed to any particular form of derangement of the stomach, of which they may be regarded as the index. They are, notwithstanding, very deserving of attention, as affording the means of aiding our judgment as respects some of the appearances presented by the stomach, and in which it is extremely difficult to draw a line between health and disease.

augmented:

abundant
and wateryBlood ef-
fused.Secretion
brown, or
black, or
green.

Total deficiency of the stomach is only met with in monsters of a very imperfect order. Even a minor degree of

Deficiency of
the stomach.

Stomach pre-
ternaturally
contracted.

Partial de-
ficiency.

Partial de-
ficiency from
destruction.

deficiency, producing a remarkable smallness of the organ assimilating it to the other and less-dilated parts of the canal, is also very rare, as a congenital state. Some degree of deficiency may exist in this organ, as an acquired state. Thus, in some cases in which scarcely any thing has entered the stomach for a considerable length of time, it has been found so much contracted, throughout its whole extent, as to appear like a mere intestine. Such a state is most likely to co-exist with stricture of the œsophagus. Yet it may also occur in cases in which the stomach has continued for a length of time in a state of extreme irritability; allowing it to receive but little, and almost invariably and immediately rejecting that. In a case of this kind, which occurred in a man who had been a most intemperate drinker, the stomach was extremely contracted in all its dimensions. It is more common to find a deficiency affecting a part, rather than the whole of the stomach; and the pyloric portion is more often affected than the cardiac. We sometimes find nearly the half of the stomach towards the pylorus so much contracted, as to appear like a part of the duodenum; but as this may merely depend upon the temporary contraction of what is called the muscular coat, we must be on our guard against admitting all such cases, as instances of deficiency: A much more complete and permanent, though at the same time a more partial, deficiency in the size of the stomach is not very uncommonly met with near the middle of the organ, under what is called hour-glass contraction. As this, however, is accompanied by morbid alterations affecting structure, I shall merely announce its existence on the present occasion, and defer the full description until I speak of the submucous cellular membrane of the stomach.

More or less partial deficiency of the mucous membrane of the stomach may take place; First, where the mucous membrane, to a greater or less extent, is removed by softening and solution. Secondly, where more or less ulceration of the mucous membrane has taken place. The

deficiency, however, in these cases, is not wholly confined to the mucous membrane: the subjacent coats may also be removed by the same cause. Sometimes an absolute opening is produced: at other times, the formation of an aperture is prevented, by adhesion to some contiguous viscus.

I have heard a case related by Dr. Graham, of Edinburgh, (under whose observation I think it occurred, whilst he resided at Glasgow,) in which a very considerable portion of the stomach was supplied by the viscera about that organ; which were so united by adhesion, as to form the parietes of the cavity into which the food was received.

Redundancy is seldom, if ever, met with in the stomach, Excess. except when a part or a whole of the organ has acquired an undue size. This is said to be commonly the case with those who are in the habit of greatly distending their stomachs with large quantities of feebly nutritious diet; as, for example, in the purely vegetable feeders of India. It seems probable that a very considerable alteration of this kind must have taken place in the stomach of the Eastern Jugglers, who practise the swallowing of swords.

The stomach is sometimes greatly increased in size, being thickened as well as distended, in cases of stricture of the pylorus. In a case of this kind, which I saw in this hospital, under the care of Dr. Back, when he was Assistant Physician, the stomach formed a large thick bag, almost reaching to the pelvis.

The stomach is not often dilated so as to form pouches; yet something of this kind occasionally takes place just above the pylorus. This has been noticed by Dr. Baillie; and a similar condition has also been observed by myself. It has likewise been met with by my friend Dr. Stroud. Dilated in pouches.

The mucous membrane of the stomach is sometimes the subject of deviation from the normal state; consisting in excess, in which the redundancy, instead of depending on an increased extent of surface, consists in the preternatural Preternatural thickness of the mucous membrane, or 'hypertrophy.'

thickness of the mucous membrane. This form of excess may be designated by the term of 'hypertrophy.'

During inflammation, the mucous membrane is somewhat thickened by the afflux of fluid which irritation brings to it: and if inflammation have persisted for some time, it may be thickened by a material of a more solid character: this, however, is not the increase of thickening to which I am now referring under the name hypertrophy; I rather allude to that condition in which a preternatural thickness has become permanent, either as the result of an extinct inflammation, or of a preternatural growth from other causes. I believe that both these forms of hypertrophy exist in the mucous membrane of the stomach. Those who have been in the habit of carefully examining the mucous membrane of the stomach, must be aware, that it is met with by no means of uniform thickness, in all cases. I have already stated, that there may be a great variety of thickness, without any deviation from the normal state: when, however, these bounds are exceeded, such thickness must, I believe, be regarded as unnatural, although it may not be connected with any manifest disturbance of function during life. I should consider a portion of the mucous membrane of the stomach of the thickness of about $\frac{1}{16}$ th of an inch, or upwards, as preternaturally thickened. If not actually in a state of inflammation, such thickened mucous membrane, although possibly reddened by the development of its capillaries, might be distinguished from the thickening accompanying present inflammation, by its superior tenacity and firmness, and by the healthy character of the mucus upon its surface. It is not so easy to distinguish those cases of preternatural thickening of the mucous membrane which are the result of inflammation, from those in which it is more probable that inflammation had no part. Yet, on the one hand, we may infer that inflammation has been concerned in producing the thickened state, when we can find traces of ulceration in or near the thickened part, where it is

either exceedingly thickened, or inelastic, or excessively lacerable; and, also, when the subjacent cellular membrane is likewise altered in character, having lost its natural laxity, so as to fix the mucous membrane, and interfere with its movements on the subjacent coats. On the other hand, I should feel considerable difficulty in admitting the connection between inflammation and thickening of the mucous membrane of the stomach, though this were considerable, if no trace of ulceration were discoverable, if the submucous cellular membrane retained its perfectly healthy condition, and if the mucus upon the membrane possessed its healthy and natural character, or, at most, was only rather redundant in quantity.

In conjunction with preternatural thickness, the mucous membrane of the stomach very frequently presents a strikingly uneven surface; appearing covered, to a greater or less extent, with granulations, somewhat like those which may be seen on the surface of a healing ulcer, yet scarcely so prominent, and generally of oblong figure. This state of the mucous membrane deserves particular attention; since it has been made the subject of a distinct article by Professor Louis, who has described it under the designation of '*mamelonné*.' He has been induced to regard it as an appearance essentially connected with inflammation; and, in fact, as the evidence of not only considerable, but protracted inflammation. I have long been in the habit of noticing this condition of the surface of the mucous membrane of the stomach, and, for want of a better appellation, I designated it by the term '*granular*,' in my records of inspections;—Louis's *Mémoire* either not having appeared, or not having come to my hands. When it did so, I could not fail to recognise his '*état mamelonné* *,' in that condition of the membrane which I had described as '*granular*.' I had often been at a loss as to the pathological value to be assigned to this appearance.

Etat mamelonné of Louis.

* See the Appendix to the article *Ramollissement de la Muqueuse gastrique*.

Whilst in many instances it occurred in subjects who might well have been supposed to have laboured under chronic inflammation of the stomach; in others, there was no evidence of this having been the case, or the extent of the appearance in question seemed wholly disproportioned to the previous symptoms. My difficulty in this respect, I must confess, has not been wholly removed by the perusal of the valuable paper of Louis. There can be no doubt but that he has clearly shewn the co-existence of this state with inflammation, in many instances: but I think that he has not proved that this co-existence is always present; or that the inflammatory state might not have been consequent, rather than antecedent, to the mammillated or granular.

I conceive that the different conditions under which this appearance is exhibited admit of an explanation which, to my mind, is tolerably satisfactory; but, in laying it before you, I offer it rather as a conjecture, than as a point actually demonstrated.

Observations on the
état mame-
lonné.

In describing this state, Louis observes, that the mucous membrane at the affected part, instead of presenting an even villous surface, as described by authors, offers, for a space of greater or less extent, elevations of a rounded figure, and from two to three lines in diameter, bearing some resemblance to the fleshy granulations on the surface of wounds, and separated by depressions of little depth. Besides these narrow and shallow furrows, there are sometimes others of a greater length and depth, and more widely separated from each other. In these furrows the mucous membrane is often rather thin, than otherwise. This mammillated state of the stomach exists to a very variable extent; sometimes being limited to a very small space; at others, occupying a considerable portion of the internal surface. It is frequently accompanied by ulcers of a rounded figure, varying from one to several lines in diameter; and causing sometimes partial, sometimes complete destruction of the mucous membrane. He further observes, that this state is uncon-

nected with the dilatation or contraction of the stomach, being very evident in stomachs in which one or other of these conditions exists in the extreme. The parts of the stomach which he points out as most frequently exhibiting the mammillated state, are, the greater curvature, the anterior and posterior surface, the pyloric extremity, the small curvature, and the cardiac extremity; which last, he observes, is never mammillated in its whole extent. Ulcers, he observes, are not in the same frequency in all parts of the stomach. He states their liability in the order just given. In most of these observations I perfectly agree; but it has appeared to me, that the smaller curvature and the pyloric third are the parts in which this state may be far the most frequently seen, whilst I cannot recollect to have ever seen it very distinctly marked in the cardiac extremity. Having often met with it in the stomachs of persons in whom there did not appear to be any sufficient reason to conclude that the stomach had been in a state of inflammation, acute or chronic, I could not but feel extremely sceptical as to its being necessarily the result of inflammation: and reference to well-recorded cases, detailed by accurate observers acquainted with this condition—amongst whom I must not omit to mention my accomplished and lamented friend, Dr. James Jackson, jun., of Boston U.S.—have tended to confirm this opinion. They have not, however, drawn the same conclusion from them: Dr. Jackson especially coinciding with his distinguished preceptor, Louis, in considering this state an evidence of inflammation. From the most careful attention which I have been able to give to this subject, I am fully persuaded that the mammillated state is to be ascribed to the greater or less development of those natural inequalities which I have already described, in speaking of the character belonging to the surface of the stomach; and which I have compared, both in figure and size, to sections of the acini of a liver when in a state of hypertrophy. It is probable that these inequalities might always be seen

Explanation
of this state

in a healthy stomach, provided it could be examined sufficiently early after death; but I have been convinced, by the examination of the stomachs of other animals besides man, that, after having been sufficiently visible in the recent stomach, they may disappear when it has become completely flaccid. When these natural elevations are most strongly developed, they are so marked and permanent, that they are not made to disappear by maceration or commencing decomposition. It is in this state that they have arrested the attention of pathologists, and have caused the stomachs in which they are seen to be called *mamelonnés* by Billard and Louis. The terms 'fungous' and 'granular' have also been employed; but I suspect that they may at times have been applied to another state of the mucous membrane, of which I have yet to speak. I believe that that state of hypertrophy of the mucous membrane which constitutes the mammillated condition may be produced by a variety of causes, having the effect of occasioning continued increased activity of the whole or a part of the mucous membrane of the stomach. Of these causes, some may be healthy and physiological, and others morbid: the former, being those which belong to the habitual diet of the individual; and the latter, chronic inflammation, with or without ulceration, and some forms of malignant disease. Some facts have led me to suppose that an exclusively or inordinately vegetable diet tends to produce this state: but I do not pretend to pronounce on this point, as one which I regard as fully confirmed. The differences in stomachs, in this respect, may possibly be very much dependent on original conformation, and similar to those which are met with in the common integuments. The existence of ulcers is, perhaps, the most frequent and powerful morbid cause, determining this hypertrophy; and their more frequent occurrence in the smaller curvature seems to me to account for the mammillated state being the most frequent, and most strongly marked in that situation. The pyloric third is, perhaps, the part in which the natural

inequalities are most conspicuous; and is, therefore, likely to be the part in which the slightest causes determine hypertrophy. In the cardiac portion, on the other hand, the inequalities are the least evident; and, moreover, this portion of the stomach is by far the most prone to that state of softness which is most favourable to their obliteration.

Although I cannot adopt the conclusion, that, in the majority of cases, the inequalities on the mucous surface of the stomach, to which the term 'mammillated' or 'granular' is applied, are to be regarded as the result of inflammation, and analogous to the granulations on the surface of a healing ulcer, or upon an inflamed conjunctiva: I am nevertheless of opinion, that there are cases in which the mucous surface of the stomach does undergo a somewhat similar alteration, as the result of severe and continued inflammation. In these cases, which are comparatively very rare, the elevations bear no resemblance in figure to the natural inequalities before spoken of. They have not the same oblong figure, are rounder, and perhaps more elevated: the mucous membrane is thick, and, containing more blood, is much redder than is natural: the stomach is contracted; and the cellular membrane, as well as the mucous, is much altered. In short, the stomach in this state presents the closest analogy with the colon in chronic dysentery. It is to this state, the term 'fungous,' which has been employed by Billard, may not be inaptly applied. A state somewhat resembling this may likewise be seen when the mucous membrane is merely turgid from congestion. Billard notices this state in conjunction with disease of the heart: but although I have often seen intense redness from this cause, I cannot say that I have ever seen the fungous state so produced. The stomach, of course, is not necessarily contracted in these latter cases; and the texture of the mucous membrane, though loaded with blood, is not necessarily otherwise altered.

Fungous
condition.

OF POLYPI IN THE STOMACH.

The stomach presents few cases of partial hypertrophy, constituting polypi either of a non-malignant or malignant character: nevertheless, a few cases of the kind are on record, which place the existence of the disease beyond doubt. Polypi, when situated near the pylorus, by preventing the free egress of the contents of the stomach, increase its size, and change its figure. The following is a remarkable case of this kind, from *Monro's Morbid Anatomy of the Gullet, &c.*

Cases.

“A lady, æt. 45, (1802,) the mother of several children, about sixteen years ago, was attacked by paroxysms of difficult breathing, which had ceased about a year before I visited her. She then complained of pain in the epigastric region, indigestion, and wind in her stomach and intestines: her body was loose, her menses irregular. She had, of late, lost much of her colour, flesh, and strength. The above symptoms gradually increased. Upon examining the belly, a tumour was found on the right side of the navel, of an oval shape, and about the size of an orange, which at the time was supposed to be lodged within the colon. Medicines were found to afford no relief; her complaints continuing without abatement. She died much emaciated.

“On examining her body after death, the stomach was found to have fallen down as low as the navel: upon opening it, there appeared a tumour adhering by a neck to its villous coat. The surface of the tumour was smooth; and the body of it so firm, solid, and tough, that it was cut through with some difficulty. The section of this polypus exhibits an uniform substance. The stomach was much enlarged, and of an unusual figure.”

Billard quotes a case presented by Rullier to the Royal Academy of Medicine, in February, 1834, in which there were as many as eighty fungous elevations, on an average as large as hazel-nuts. He mentions seeing a case himself, in which three bodies as large as french-beans, and having a

rough surface, were attached, by a slender neck, to the mucous membrane of the stomach, which was otherwise healthy. In another case, the polypus grew from the valve of the pylorus. In some cases of malignant disease of the stomach, the excrescences from the mucous membrane almost assume the size and form of polypi.

OF THE APPEARANCES PRODUCED BY INFLAMMATION OF THE
MUCOUS MEMBRANE OF THE STOMACH.

I have already stated the remark of Billard, that the mucous membrane of the healthy stomach, when excited by the presence of food to that degree of activity which is necessary for the purpose of digestion, presents a diffused light rose-red colour. It will be well to bear in mind this first and healthy step in the scale of irritation, when we are advancing to the consideration of those higher degrees of irritation which constitute a morbid state, and merit the appellation of inflammation; seeing that it may assist us to avoid being led astray by various appearances which are liable to be confounded with the effects of inflammation.

First effect
of irritation.

An appearance very similar to that which is produced by the healthy stimulus of recently-taken food is also produced by agents which are known to act as a stimulus to other portions of the mucous membrane. Thus ardent spirits, when taken into the stomach, have been observed, where accidental death has shortly followed, to give rise to a very similar appearance. It is extremely probable, that the small drams, which commencing drinkers occasionally take on the plea of necessity, owe their delusive and temporarily grateful influence to their power of producing this semblance to healthy activity, which cannot fail to be misplaced and injurious when called into needless existence; nay, even when taken in conjunction with food, to promote the process of digestion. The habitual employment of such stimuli must be injurious, by blunting the sensibility of the stomach to those articles which are really nutritious, as well

as by contaminating, by the admixture of a deleterious principle, the nutrient juices which the absorbent vessels have to imbibe. Can we then be surprised, either at finding, in the stomachs of those who have been the habitual consumers of ardent spirits, appearances which are known to be the result of chronic disease;—or at the debilitated and squalid appearance which they exhibit during their shortened lives;—or at the morbid and fatal changes which are produced in other organs besides the alimentary canal? May it not be truly said of the still, “*Ex hoc fonte derivata clades in patriam populumque fluxit?*” When irritants of a greater energy than alcohol of the quality and in the quantity usually taken, yet not of a description to act as escharotics and produce a direct chemical or mechanical lesion, have been taken into the stomach, we find its mucous membrane of a red colour, similar to that produced by digestion, or by the use of alcohol as respects its diffusion, and to a great degree as respects its combination—if I may so express myself—with the mucous texture; yet considerably more deep and intense, as to degree. Besides this diffused colour, or ground, as painters term it, there are numerous points of a still greater intensity, and the capillary vessels are here and there seen distinctly injected. The mucous membrane appears somewhat thickened; but is, perhaps, in most instances, more than usually tender.—I must not omit to mention another appearance, which I believe to be essentially characteristic of a recently-acute inflammation of the mucous membrane of the stomach, but which, as far as I am aware, has not been noticed by those pathologists who have treated of this subject. The appearance to which I allude is that of an almost infinite number of scattered, small, nearly opaque, whitish spots, which are rather lodged in the mucous membrane itself, than situated upon its surface. I perhaps may succeed in conveying some idea of the appearance to which I allude, by comparing it to what may be seen in oatmeal-gruel, in which, when well prepared, the

Appearance
of the re-
cently-
inflamed
stomach.

mass is semi-transparent, but holds in suspension small particles of the grain, which are incapable of solution, and retain their opacity. Imagine the semi-transparent mass to be tinged with some transparent red colour, and you will have a pretty accurate conception of the appearance which I am now pointing out. I have seen it strikingly and extensively present in the stomach of an individual who had taken a large and fatal dose of prussic acid; and also where arsenic had been taken in a state of solution, and consequently did not act as an escharotic. Whether these small opaque points are depositions of coagulable lymph, or not, is a question which I am not prepared to decide. Since the appearance first arrested my attention, I have had but few opportunities of repeating the observation; but I conceive that it merits special attention, in reference to legal medicine. When the inflammatory excitement occasioned by an active irritating agent is very considerable, we have not only an intense diffused red with points of still greater intensity, but the distended capillaries at these points give way, and allow a little blood to escape. Whether this is to be considered merely a rupture from distension, or whether it is not rather to be ascribed to the altered and softened condition of the inflamed part, which is both an effect and a cause of the distension of the capillaries, I cannot decide; but I conceive the latter supposition to be the more probable, and to be more analogous to the effects of inflammation in other parts. You will recollect the close parallel to the appearance which I have now described, in what takes place on the surface of a serous membrane, when a layer of coagulable lymph has been deposited upon it, and the process of organization is about to commence. The serous membrane appears slightly thickened and roughened; the vessels are minutely injected, though not uniformly so, some points being more intense than the general mass: at these points a little blood is seen to escape, and the false membrane is more or less discoloured and spotted with it. Even in this last respect the

Intense inflammation.

Secretion
altered.

Plastic.

Rarity of
idiopathic
gastritis.

Broussais.

similarity between the intensely-inflamed serous and mucous membrane is sometimes kept up; the character of the secretion, in the latter case, being so much altered, that coagulable lymph is thrown out, and, being applied to the inflamed surface, becomes spotted with blood, by receiving a small quantity of it in the way which I have been just describing. I have particularly observed this inflamed state of the mucous membrane in a case of poisoning from arsenic taken in substance, a portion of which adhered to the surface, and occasioned an appearance of abrasion; whilst the surrounding portions, which were deeply reddened, were covered with a false membrane, beneath which they were in the state of which I have been speaking. Although the exudation of coagulable lymph, and the production of an incipient false membrane, sometimes take place, yet this is not a common occurrence in gastritis: the secretion, however is characteristically altered; sometimes it appears considerably increased.

Acute gastritis as above described, except when produced by poison or highly-irritating articles, is certainly a very rare occurrence; although the disciples of Broussais conceive that it exists, as the essence of every case of fever. It must however be admitted, that the functions of the stomach are most materially altered in the course of fever, and, in some instances, to a degree which makes its derangement one of the most important affections with which we have to contend in the treatment of the disease; so much so, that the lasting thanks of the Medical Profession are due to Broussais, for having called the attention of his brethren to the consideration of the subject: yet there are many of his predecessors, whom he ought not to eclipse, who distinctly pointed out the existence and importance of gastric disturbance, and irritation of an inflammatory character in fever, though without regarding them as the very essence of the disease. N. Fodera, a zealous and industrious physician of Catania, who resided some years in Paris, whilst

the excitement caused in the Medical Profession by the publication of the views of Broussais was at its height, collected and published the observations of several of the most distinguished physicians who had preceded Broussais in pointing out the serious derangement of the stomach in conjunction with fever; some of whom had likewise anticipated Broussais, in strenuously recommending some of the most valuable measures to be employed in counteracting the symptoms arising from that cause. N. Fodera.

He particularly cites Baglivi, whom he shews to have regarded the stomach as the seat of most fevers, whether epidemic or contagious; but who, like Broussais, admitted the part also performed by the intestines. In reference to the importance of the stomach, he uses these remarkable words: "*Dum viget stomachus, vigent omnia.*" He also anticipated Broussais in his dread of purgatives, when he gave this precept, "*Fuge purgantia tanquam pestem.*" Baglivi.

Rega advocated similar views respecting the stomach, in his work "*De consensu partium corporis humani, ac potissimum ventriculi, in statu morborum;*" in which he says, "*Præmissa generali febrium idea ostenditur eorum fomitem in ventriculo sæpiùs hære.*" He regarded contagious fever and plague as having gastritis for their cause. Willis had referred intermittent fever to an irritant cause acting on the stomach. The treatment recommended by Baglivi and Rega was consistent with their pathological opinions. Prost seems very clearly to have anticipated Broussais. He was less theoretical, but perhaps more practical, and drew his conclusions from laborious observation. He may also be compared with Louis, at some of whose conclusions he appears to have had a glimpse. He regarded the mucous membrane of the intestines as being at least equally concerned in the production of fever, with that of the stomach. Rega. Prost.

Professor Frank of Vienna is another distinguished authority, by whom the importance of gastric symptoms in Frank.

febrile disturbance has been fully recognised, though not pushed to the extreme to which it has since been carried. It is needless to adduce further proofs that before the time of Broussais' celebrity the opinions contained in the following quotation from Ettmüller had been acknowledged and acted upon by some of the most able teachers of our profession:—" *Jus enim ventriculi est universale in totum corpus, adeoque in theoriâ morborum maximam semper sui postulat considerationem, uti non minus in praxi legitimâ semper quoque ad eum respiciendum est.*" It is only just to the memory

Dr. Curry.

of Dr. Curry, to observe, that although theoretical views not based on sufficiently careful pathological observation induced him to lay undue stress on the supposed existence of hepatic inflammation, his grand remedy, the application of cupping to the pit of the stomach, mainly rests on the correctness of the observation, that in a large number of febrile cases the most striking benefit is obtained by combating the tenderness, heat, and distress of the epigastric region by the local abstraction of blood;—a mode of treatment, which those who have followed the medical practice of this hospital must have often seen to be sanctioned under the successful direction of Dr. Cholmeley.

Dr. Cholmeley.

Although the modified and moderate assent which is now given to the views of Broussais have almost restored acute gastritis to the rank of a comparatively rare disease which it formerly occupied, and though, cases of poisoning excepted, we have but few opportunities of witnessing the effects of gastritis of sufficient intensity to be regarded as the cause of death, there can be no doubt that we may often find appearances in the stomach which ought to be ascribed to inflammation, acute or chronic, of its lining membrane. We may regard as indications of an inflammatory condition of recent existence, redness of the mucous membrane caused by injection; the vessels at the injected part being proportionably more turgid than the superior order of vessels leading to or from the part. The redness, which, as Billard

has observed, may assume various appearances, is generally disposed to prevail in spots, which are sometimes minute, rather than to be uniformly diffused, or to correspond with the dependent position. The inflamed membrane, thus reddened, is more tender than in the healthy state; although, from the afflux of fluids, it may seem to be thickened. Hence slight violence will cause the reddened spots to bleed; and instead of possessing its ordinary tenacity, the texture is soft and pliable, and can only be detached in small fragments, or may be scraped into a pulp.

The conditions which warrant the suspicion of chronic inflammation are, the mucous secretion being preternaturally increased in quantity. It is either thick, transparent, and ropy; or, being less transparent, is either viscid or puriform. The membrane itself may be of various colours, which it may have acquired either during life or after death. It may be red; and, besides being sensibly injected, it may be more intimately coloured from habitual afflux of blood; or, inflammation having subsided, and the causes of congestion not existing, there may be absolute anæmia, producing paleness; yet even in these cases some discolouration may be left in the membrane itself:—colour is therefore a fallacious evidence. The membrane is, perhaps, always thickened; and this hypertrophy is often characterized by the granular or mammillated state of which I have already spoken. The texture is dense and firm, from the actual addition of solid material; but it may be rather friable. I have sometimes noticed the surface to be both firm and uneven, to a degree which has occasioned sensible resistance and sound, when the edge or back of the scalpel has been scraped over it. I can only attribute this form of hypertrophy to a long-continued but low degree of inflammation. From the habitual afflux of blood to a texture so developed, it may be expected to exhibit bloody points, when cut, torn, or crushed. If the membrane, in addition to its chronic change, has been in a state of recent inflammation, we may expect to find

Chronic inflammation.

Changes in the secretion.

State and appearances of the membrane.

greater redness, but more marked deficiency in elasticity and tenacity, amounting to absolute softness. The concurrence of ulceration with the condition already enumerated is by no means unfrequent in chronic inflammation, and is one of the least equivocal proofs of that state.

Having now stated the appearances exhibited by the mucous membrane of the stomach when diffused inflammation has existed at the time of death, I shall now notice some of the appearances which are liable to be mistaken for the effects of inflammation, before I proceed to speak of the effects of inflammation when it has proceeded to the production of ulceration.

Appearances
to be distin-
guished from
inflamma-
tion.

Congestion.

Cadaveric
changes.

Although I have remarked, on the authority of Billard, that the mucous membrane of the stomach, when we have an opportunity of examining it in a state of perfect integrity and uninfluenced by accidental causes, is of a white colour and free from injection, yet it by no means unfrequently happens, that the capillaries of this membrane become generally or partially injected, so as even to produce an intense colour from congestion, without inflammation or irritation having any share in its production. This discolouration is, I believe, often to be considered a purely cadaveric appearance, being strictly analogous to the purple blotches and stripes which the common integuments so often exhibit after death, and which are known by the name of *maculæ mortuæ*. As these discolourations of the common integuments are much more influenced by position than by any circumstance which attended them during life, and are far more striking and intense in their colour than the effects of the most severe inflammation which has not produced ulceration or separation of the cuticle; so the discolourations of the stomach from this same cause—namely, congestion—are, not unfrequently, far deeper, and more intense, than the effects of severe and even fatal gastritis. The general appearance and distribution of blood in the vessels of the mucous membrane is so far similar, that Billard has thought it necessary

to speak of its appearances under the same terms; but styling them in the one case inflammatory, and in the other non-inflammatory:—thus he speaks of diffused, arborescent, ramiform, spotted and streaked redness, both inflammatory and non-inflammatory.

Although sanguineous injection of the vessels is very much influenced by the position of the part in which it takes place, there are other circumstances to be taken into account, as materially modifying intensity and distribution. When death has taken place under circumstances which have materially interfered with respiration, and retarded the return of venous blood towards the heart, the injection of the capillaries is very much promoted. We see this in the bloated livid face, the deep purple ears, the extensive blotches with which the back is discoloured, and also in many internal parts: these, however, are not equally affected in every case; sometimes one, sometimes another, either being the seat of extreme congestion, or remarkably escaping it; the one organ being surcharged at the expense or to the relief of the other; universal congestion being necessarily impossible. In these cases, the mucous membrane of the stomach generally, but not invariably, comes in for a share of the congestive injection. Amongst the causes of death which contribute the most to produce congestion of the internal parts, and of the mucous membrane of the stomach in particular, I know of none more remarkable, or which it is more important to bear in mind, than affections of the heart. In cases of this kind, I have seen the greater part of the mucous membrane of the alimentary canal almost universally and deeply injected; sometimes even to the extent of producing, more or less, considerable and diffused sanguineous transudation. I have observed in some instances, and I believe that the remark might be applied pretty generally, that the injection in these cases is by no means of so livid a colour as when it is the result of bronchitis, pneumonia, or other causes, more absolutely causing death by asphyxia. As I have already had occasion

Influential
causes.

Diseases of
the heart,
& asphyxia.

Physiological or habitual liability to determination of blood.

to remark, these congestions, although they may be styled cadaveric, really commence before the final expiration. Now, though the patient labouring under disease of the heart is often much distressed by oppression of the chest, it frequently happens that the *articulus mortis*, in such cases, is rather sudden than protracted; which I conceive may have some effect in preventing the injected blood in the capillaries from acquiring the deepest venous hue. Amongst the causes which may contribute to influence the situation in which the most remarkable congestions take place, must, I believe, be recognised the peculiarity of different parts in their healthy physiological state, with respect to the reception of blood: thus, it is well known that the cardiac half of the stomach is much more frequently found injected; and that, when injected, it is of a more intense colour than the pyloric half: but it is also believed by many, if not generally admitted, that it is in the cardiac half of the stomach that the principal action of the organ in digestion takes place; that it is here the peculiar solvent secretion is chiefly formed; and for this reason the vessels of the part must be habituated to considerable accessions of blood. In like manner, I conceive that those stomachs which have been habituated to an inordinate afflux of blood, by the use of too frequent or too powerful stimulants, may exhibit, after death, an inordinate degree of injection, although no absolute inflammation had existed at the time of death. The stomach of that extraordinary individual, who survived for several years after he had swallowed knives, although certainly an extreme case, may be adduced as an illustration of my last remark; the foreign bodies having remained so long in his stomach, that it had, in a great measure, become accustomed to their presence. The man did not die from gastritis, but from perforation of the intestine: the stomach however, which must have been in a constant state of irritation, was not only the subject of hypertrophy and distension, but was so deeply injected, that the discolouration is evident after the lapse of many years.

Another cause, to which may probably be referred the more considerable injection of some parts, must, I believe, be reckoned the proximity of organs liable to considerable congestion, and which possess sufficient vascular communication to allow of the transfer of blood from one to the other. We have, therefore, another cause, in addition to that which I have already assigned, of the frequent injection of the cardiac extremity of the stomach in the proximity of the spleen: this, however, is a point on which I lay but little stress, as I have not yet paid sufficient attention to the co-existing condition of the spleen and cardia, with reference to it.

Influence of
neighbour-
ing parts.

In order to distinguish these cases of congestive injection from those which are the result of inflammation, it is necessary to pay attention to the following points:—

Distinctive
characters.

1st, The texture of the mucous membrane in a state of injection differs only from the healthy condition in containing a larger quantity of blood, and that, for the most part, of a venous hue. It is neither softened nor indurated; except, that the former state may sometimes have been partially induced by the operation of the solvent juices of the stomach, or as a part of the general effect of softening of different textures of the body; amongst which, the mucous membrane of the stomach is the most frequent as well as the most striking seat.

2dly, The secretion on the surface of the membrane is not altered in quantity or consistence, except when discoloured by transuded blood; when it may receive various degrees of intensity of red, and perhaps some increase of consistence.

3dly, The sub-mucous cellular membrane retains its natural texture, and therefore allows the natural mobility of the mucous membrane upon it: it likewise allows of the mucous membrane being torn off in shreds, as in the case of a mucous membrane presenting its most natural appearance.

4thly, The vessels communicating with the mucous membrane, but more especially its principal venous branches, are distended and turgid with dark blood: this last appearance is, perhaps, the most important criterion by which we may be led to distinguish the effects of *congestion* from those of *inflammation*.

Semblance
of inflammation
accidentally pro-
duced.

It sometimes happens, that, after removing the mucous from the surface of the stomach with the edge or back of the scalpel, the mucous membrane appears sprinkled with bloody spots. It is necessary to be on our guard against confounding this appearance with the result of inflammation, since some of the distinguishing characteristics cannot be present. The mucus has been removed, and the vessels communicating with the mucous membrane are not, as in the case of congestion, necessarily found distended with dark blood. This spotted state of the mucous membrane may be confounded with inflammation, by those who are not familiar with the appearance, or with the mode of its production. The case appears to be, that the edge of the instrument passed over the mucous membrane empties some of the capillaries, and occasions the repletion of others; and in this state they arrest our attention: whereas, before this operation had been performed, the quantity of blood diffused pretty uniformly through the mucous membrane would not have attracted observation. When we look at the spots thus produced by rasure, with the assistance of a lens we may readily distinguish that the blood is not distinctly seen contained in capillaries, and consequently not presenting a strictly dendritic or ramiform character: they consist, rather, of small ecchymoses, with a very few capillaries, deranged in their position, immediately in their vicinity. When, as not unfrequently happens, the injection of the mucous membrane of the stomach is not diffused over the whole or part of the mucous membrane of the stomach, it is apt to occur in streaks, varying both in length and breadth. I can assign no cause for their assuming this form, unless it

be attributable to the mucous membrane having been thrown into *rugæ*, which have subsequently been obliterated by distension or other causes; the summits of *rugæ* being the parts of a mucous membrane the most prone to become injected. This remark is equally applicable to the inflammatory, and the congested lining membrane of the stomach.

It is also essential to bear in mind, that the mucous membrane may acquire a great increase of colour by exposure to the air. This is most strikingly the case with the mucous membrane of the stomach, which not unfrequently may be seen to become very remarkably reddened; although, when first opened, its discolouration may have been too slight to attract attention. The importance of this fact, in cases of inspection for judicial purposes, is too obvious to need any comment from me.

Redness produced by exposure to the air.

It is extremely common, on inspecting the stomach, to find that the discolouration, though considerable, is not of a sanguineous colour: we find it of various shades of brown, generally irregularly distributed, but most frequently in blotches and stripes in the cardiac half. This discolouration has been regarded by some foreign pathologists as the effect of chronic inflammation. I am, however, inclined to agree with Portal, that this brown discolouration is not to be regarded as an evidence of chronic inflammation, or of inflammation at all, but that it may be seen in a perfectly healthy stomach. I consider that it is produced by the action of gases collected in the abdomen; or of materials contained in the stomach, upon the blood by which the vessels of the discoloured part had been injected. I believe that sulphuretted hydrogen is the principal agent by which this change is produced: and, as it effects such changes in a very short time—of which we may frequently have a proof under our own eyes—we need have no difficulty in believing that the stomach examined some hours after death may exhibit the shades of colour of which I am speaking, though during life it had been the

Brown discolouration of the mucous membrane not a proof of chronic inflammation.

subject of sanguineous injection, either inflammatory or of a congestive character. Other agents besides sulphuretted hydrogen may produce this change. In connection with such changes, I would recommend to your attention the views and researches of Dr. Stevens. That the brown discolouration of the mucous membrane of the stomach is rather a cadaveric than a purely pathological appearance, is rendered further probable, by the fact, that though I have repeatedly examined stomachs so recently after death, that not only the animal heat was but little reduced but the peculiar odour exhaled during the digestive process was sensibly present, I do not remember ever to have met with the brown streaks and blotches in conjunction with this odour. I do not think that this is to be explained by the odour in question being the characteristic of a healthy stomach, whilst the discolouration in question is that of the diseased stomach; since we may find the odour of digestion exhaled from a stomach which is not in a healthy state, even as to structure: moreover, if the brown discolouration were the effect, as it is represented, of chronic inflammation, it is very evident that it could not have been incompatible with digestion. The opinion which I have now offered respecting the brown discolouration of the stomach, and which I have been induced to form by observation alone, is, I find, precisely similar to that which Andral has given in his "*Précis de l'Anatomie Pathologique*;" which I consider an important evidence in favour of it, since Andral had previously taught that the brown and the grey, of which I shall next have to speak, were marks of chronic inflammation. Before I quit the subject of brown discolouration of the stomach, to avoid the chance of misapprehension, let me repeat, that I consider the brown discolouration of the mucous membrane of the stomach is a result of a change of the colouring matter of the blood by gaseous or other fluids; that it may be produced in a mucous membrane whether in a healthy or pathological state; and that therefore, whilst on

the one hand we must be on our guard against setting it down, as some pathologists have done, that this discolouration is the result of disease, we must on the other hand be on our guard against concluding, because it is generally a cadaveric appearance independent of disease, that the stomach is not unhealthy where it exists. So far from this, I believe that the stomach, having previously been the subject of disease, may rather accelerate this cadaveric appearance; nor am I prepared wholly to deny, that a brownish discolouration of the mucous membrane of the stomach may, in some instances, really be the effect of a chronic inflammation, or one that is altogether extinct, seeing that such a condition is by no means rare with respect to the common integuments. At the same time, I have no proof that this is the case with the stomach; and only suspect it in those cases in which the discolouration is faint, and rather belonging to the membrane itself, than tracing the course of the subjacent vessels.

The mucous membrane of the stomach is sometimes met with of another colour; of which I entertain an opinion very similar to that which I have just expressed with regard to the brown discolouration;—I allude to a grey or slate colour. This tint, which is not only met with in the stomach, but in other parts of the alimentary canal, may be produced in two modes; both of which I have had occasion to notice, in my remarks on the pathological indications afforded by colour. First, the grey may be produced by an infinite number of minute black points and streaks; and, secondly, by a more diffused discolouration of a lighter hue: the first of these, though not uncommon in many parts of the alimentary canal, is seldom seen in the stomach. I have already stated the opinion, that it is not to be regarded as a token of chronic inflammation, as some have taught; but either the effect of a wholly subsided irritation, or of a cadaveric change produced by gases acting on the blood in the capillaries. Secondly, the diffused slate or

Grey or
slate colour.

leadened colour, which is by no means rarely seen in the stomach, and which has also been spoken of as a token of chronic inflammation, I regard as altogether a cadaveric appearance, perfectly analogous to what we meet with on the concave surface of the liver, when it has been in contact with the colon, by the sulphuretted hydrogen in which I believe the change to have been effected. The pale leadened hue of the stomach I believe to be produced precisely in the same manner, by gaseous influence; but whereas the brown discolouration of which I have been speaking takes place where there has been considerable injection, the colour which we are now considering seems to be produced where there is little or no injection. Hence it is sometimes seen in the substance of the pancreas. It does, however, take place when the vessels are wholly or partially injected: consequently, as Billard has described, we have ramose, arborescent, and spotted, as well as diffused slate-coloured discolouration of the mucous membrane of the stomach.

ULCERATION OF THE MUCOUS MEMBRANE.

Ulceration may be regarded as one of the most unequivocal indications of inflammation having existed in the mucous lining of the stomach; but it is by no means the necessary or even most frequent attendant of that state of the membrane. When ulceration exists, it is far from being of the same character in all cases. I must therefore proceed to notice the forms of ulceration in this organ which have more particularly arrested my attention. In the simplest cases, we may find in a stomach of which the mucous membrane exhibits a degree of redness and thickening which would indicate the presence of inflammation, one or more small and irregular, and generally rather superficial, spots of abrasion. When there is more than one ulcer, they are almost invariably near to each other, with rather a superior degree of vascularity in their vicinity:

Description
of the different forms
in which it
occurs.

the edges present a little irregularity; that is to say, they have not the defined clear-cut limits which characterize a particular form of which I shall hereafter speak. I cannot say that these ulcers are confined to any particular part of the stomach; but they are, perhaps, most frequently met with near the middle of the organ. I have been surprised at the degree of disturbed health and stomach-derangement which appeared to have been the effect of these seemingly-slight lesions. I have seen ulcers in the stomach having the general character which I have just given, but of an elongated figure, of which the situation and direction appeared to be determined by the course of some of the subjacent vessels.

There are other cases, in which the abrasion is very slight, and attended with a little increase of colour; and the spots are small, numerous, and pretty nearly equidistant. I have not been able to decide whether these spots are in any way connected with the natural inequalities of the surface of the membrane, or whether they are influenced by follicular appendages. When the mucous membrane of the stomach has long been the subject of superficial ulceration affecting different parts in succession, it would seem that cicatrization may follow the process of ulceration, and give rise to a peculiar, irregular, and puckered surface, bearing some resemblance to the appearance of the throat after extensive ulceration, or to a state already described as sometimes occurring in the mucous membrane of the trachea. It is much more common to meet with old ulceration of another character. It is generally confined to a single spot, having almost invariably an elongated figure. It may be no larger than a melon-seed, or as much as two or three inches in length, and half as much in breadth. The edges are well-defined, and firmly adherent to the ulcerated surface. The ulceration in these cases has sometimes nearly or quite penetrated through the other coats, as well as the mucous; and but for

firm adhesions to the contiguous parts, the contents of the stomach would not be retained. In consequence of this loss of substance, the edges of the ulcer are elevated above the ulcerated surface, which, even in the oldest cases, when cicatrization is the most complete, does not present the true characters of a mucous membrane. Although the edges are raised above the ulcer, they are not necessarily or sensibly so above the neighbouring mucous membrane, which is very generally firm and thickened, presenting the most marked specimens of the mammillated condition. The most frequent situation of these ulcers is in or near the small curvature; and adhesions to the pancreas is not an uncommon consequence. A severe and obstinate form of dyspepsia, with remarkable emaciation, sometimes accompanies these old ulcers in the stomach, even when the signs of active inflammation have ceased to exist, and the process of cicatrization appears to have been completed.—There is still another form of ulcer, which is probably allied to aphtha. The ulcers in these cases vary from an eighth of an inch to half-an-inch, or rather more, in diameter. A portion of mucous membrane appears to have been cleanly cut out with a punch. The edges are perfectly defined, but not thickened: there is no areola around them: the exposed cellular membrane is perfectly pale, and retains its natural laxity: this permits the movement of the ulcerated spot, since the edges are not adherent. The loss of substance sometimes proceeds through the other coats; but the diameter is greatest in the mucous membrane, and least in the peritoneum. Sometimes this coat alone remains: sometimes there is a small perforation in it, which, though scarcely large enough to admit the passage of a small probe, nevertheless has allowed the escape of fluid from the stomach, by which the most violent symptoms of peritonitis have been excited, and proved fatal in a very few hours. In the neighbourhood of such ulcers I have seen numerous small spots, not larger than

the head of a small pin, of a light colour, and very slightly affecting the surface of the membrane. I regarded them as closely connected with the ulcers, and probably an early stage of that form of loss of substance. These spots, and the very peculiar punched appearance of the ulcers, seem to favour the idea that the affection is of an aphthous character. I am further inclined to believe that these cleanly-cut and deep ulcers are the earlier stage of the deep chronic ulcers which I have before described; but the formation of peritoneal adhesions, by which death, from the escape of the contents of the stomach, is prevented, and the cicatrization which has more or less advanced, indicate that a material change in the morbid process must have taken place.

OF SOFTENING OF THE STOMACH.

I have already remarked, that there is a considerable difference in the degree of consistence and tenacity of the mucous membrane of the stomach, and that it may not unfrequently be separated with the finger-nail or the back of the scalpel. The condition of which I have now to speak, consists in a much further degree of softening; so much so, that the mucous membrane appears to be reduced to the state of a glairy mucus; beneath which, sometimes the cellular membrane, sometimes the fibrous layer, and at other times the peritoneum also, is exposed; and, in extreme cases, even this latter is perforated, and neighbouring parts become more or less disorganized. Instances of this mode of derangement of the stomach have long been noticed; and some were pointed out by John Hunter as examples of the solution of this organ by its own secretion. Of later years, this morbid condition has engaged the attention of French pathologists; and Professor Louis, in particular, has written a laborious article upon it, in which he maintains the opinion that it is a result of inflammation, and is, very often, a chronic affection. Before going into a discussion respecting its nature, I will endeavour to

Opinion of
John Hunter.

Of the
French Pa-
thologists.

Description
of the ap-
pearances
produced.

describe the appearances which it presents, and to take a glance at the usually-attendant symptoms. You will thus be enabled to recognise the cases which Louis has had in view. Although, in cases of softening of the mucous membrane of the stomach, this derangement never extends to the whole internal surface of the organ, great differences exist in the amount of surface softened or removed. Sometimes, at a spot of one or more square inches in extent, the mucous membrane is of the consistence of soft pulp, or resembles semi-transparent viscid mucus, or is altogether removed, leaving the subjacent structures exposed. The limits of the portion so deranged, are ill defined; the neighbouring mucous membrane being gradually reduced, in thickness and tenacity, towards the affected spot. Louis says, that in some cases, which he regards as an incipient form of the affection, the mucous membrane is not removed, but merely very much reduced in thickness. The attenuated mucous membrane, or the exposed sub-mucous cellular membrane, often exhibits a semi-transparent, bluish-white colour; but various shades of red and other colours are occasionally observed. Louis has recorded, respecting many of the cases which he has observed, that the vessels thus exposed are large and empty; but though I have noticed the preternatural visibility of the gastric vessels, which seemed to be occasioned by the removal of a part of the super-adjacent structures, I have not been sensible of their inordinate size. Softening of the mucous membrane of the stomach varies in figure as well as in extent: sometimes it occurs in blotches, having but a few square inches in size; in other instances, it extends to a third part of the stomach, or even further. It sometimes occurs in stripes or bands.

This disorganization does not occur with equal frequency in all parts of the stomach: it is most frequent towards the cardiac extremity; next, in the greater curvature; and still less in the smaller curvature; whilst at, and near, the pyloric

extremity, it has seldom, if ever, been seen. In many cases, the softening extends to the lower portion of the œsophagus; in which it may occur in vertical stripes, separated by narrower portions, in which the natural appearance and consistence remain. The softened portions present the bluish-white and the brown colours observed in the stomach. In other cases of softened œsophagus, the alteration is limited to a particular spot; and in others, again, nearly or quite the whole lower portion of the tube is destroyed. Though softening of the stomach is, perhaps, most frequently and conspicuously seen in the stomachs of which the mucous membrane is naturally thin and tender, it is occasionally met with in conjunction with a state to which I have already alluded, under the term *mamelonné*; whence Louis, who makes the observation, draws an argument in favour of the affection being one of an inflammatory character.

General
characters.

Examples of softening of the stomach are by no means rare. Louis, whose observations on this point are entitled to the highest authority, found softened stomach in a twelfth part of the subjects examined by himself. He met with it in females more frequently than in males; in the proportion of eight of the former to four of the latter in his first group of cases, and of twenty-one to twelve in his second. The inquiry was instituted in wards designed for the accommodation of an equal number of male and female patients. I can offer nothing similarly positive with respect to the influence of age; but I believe that the stomachs of children are prone to softening. I met with the best-marked instance which I have ever seen, in the stomach of a child of eighteen months or two years of age: and several striking cases, occurring in the stomachs of infants, were observed and collected, as dried preparations, by Dr. Germain, a zealous and excellent student attached to the clinique of Professor Rostan, during a part of my attendance at the Hospice de la Salpêtrière.

Symptoms.

In a very large majority of the cases of softened stomach which have been observed and published by Louis and other authors, and also those which have come to my knowledge from other quarters, the previous symptoms, when they have been ascertained, have been strongly indicative of derangement of the stomach. There have been nausea, sickness, and vomiting in almost every degree of urgency and obstinacy. In some cases, there has been the most complete intolerance of all ingesta, whether food, or medicine. In others, food has been borne for a time, and has even produced a mitigation of suffering. The appetite has been variable, but often deficient. Digestion, however, has been difficult, even when food has been tolerated, and the secretions of the stomach have been evidently deranged. This has been a frequent symptom; and pain in the epigastric region has occurred in nearly all the cases. It has sometimes been accompanied by a sensation of heat, and great sensibility to pressure, rendering it almost insupportable. The appearances of the tongue have, in these cases, been neither comitant nor uniform. The state of the bowels, and other more remote symptoms, have varied in different subjects, and with the variety of maladies with which the gastric affection has been associated.

Nature of the disorganization.

Although there is a striking degree of similarity, amounting almost to uniformity, in the prominent symptoms which have been observed in many of the individuals whose stomachs, after death, have been found in a state of considerable softening; which has, doubtless, been the principal circumstance by which Professor Louis has been led to regard it as the disorganization upon which the symptoms have depended; I confess that I am much more disposed to adhere to the opinion of John Hunter, that the softening of the stomach is really a cadaveric change, dependent on the structure of the stomach being acted on, after death, by its own solvent secretion. Were it a change which had taken place during life, it would seem to be almost inevitable

that the weakened portions should be preternaturally dilated into pouches by the action of the contractile fibrous coat in those parts of the stomach which are not so affected. In fact, we should expect to find that the movements connected with the process of digestion, and more especially the contraction of the stomach in vomiting, which not unfrequently takes place in these cases, would have caused the formation of pouches analogous to those which are occasionally found in the urinary bladder, when, in cases of stricture or enlarged prostate, the contractile fibrous coat of that organ has been unequally hypertrophied. On the other hand, the appearances are precisely such as might reasonably be expected from the action of a solvent fluid upon the dead stomach. The mucous membrane, as the first and most immediately exposed, and also, perhaps, as the least capable of resistance, is most extensively and completely dissolved, and in some instances is the only tissue affected. The subjacent tissues are generally softened in proportion to their degree of exposure; but in extreme cases, in which there is reason to suppose that the solvent fluid is copious as well as powerful, we find, not the stomach only, but adjacent parts, affected in a perfectly similar manner: thus we sometimes find not only the peritoneum, but also the tendinous and muscular structure of the diaphragm, similarly but partially affected; yet the tendinous fibres, from their superior strength and density, are found to have afforded the greatest resistance. The fact already stated, that the lower part of the œsophagus not unfrequently participates in the softening with which the stomach is partially affected, is precisely what might be expected from the action of the fluid in the cardiac extremity finding its way, after death, into the œsophagus; which we know to be very often the case in the dead subject, when the solvent power is not so remarkable. It is unlikely that such a regurgitation takes place during life; and still more improbable that a morbid disorganizing process could be set up

in that part without giving rise to peculiar and distinctive symptoms. I cannot help laying considerable stress on the peculiar odour which I have noticed in the parts broken down and softened in these cases; and which, not only in the stomach, but also in the adjacent parts, has been precisely that which is characteristic of recent digestion. I was particularly struck with this in the perforated stomach of an infant, whose diaphragm and œsophagus were partially destroyed by the same cause. Should it be objected, that if the softened and perforated stomach were an instance of cadaveric change solely produced by the action of a solvent fluid, the destruction, instead of being limited and partial, would be more general; we have an answer furnished by cases of perforation of the stomach from the swallowing of sulphuric acid, in which no doubt can be entertained as to the mode in which perforation is produced. In such cases, it is at or near the larger extremity that the perforation takes place; other parts of the stomach remaining comparatively intact, whilst neighbouring organs adjoining the perforation are similarly affected.

You will perhaps inquire, if this be the state of the case in the instances of the softening of the stomach which have been reported by pathological writers, whence arises the similarity in the previous symptoms, and how can so faithful and accurate an observer as Professor Louis have been able to make out so clear and connected an account of the symptoms and appearances, supported as it is by numerous and well-detailed cases?—I reply, that I am far from undervaluing the memoir, or from doubting that Professor Louis has produced satisfactory evidence of their being a set of symptoms indicating a particular derangement of the stomach, which has occurred in a large proportion of those cases in which, after death, the stomach has been found more or less destroyed by softening. I differ from him as respects the explanation, and for the reasons which I have just adduced. This conclusion necessarily

leads me also to differ from the Professor on some other points; namely, that the affection may assume a chronic character, and last three and a half, six, and even thirteen months; that it may have advanced to a considerable extent, and yet admit of cure; and that cases of evident old destruction of a part of the lining membrane of the stomach are to be ascribed to this cause.

I believe that the assemblage of symptoms of gastric disturbance, which has been enumerated in connection with cases of softening of the stomach, is not to be considered as dependent on that derangement of structure, but that the symptoms mark the morbid condition of the stomach in which its vitiated secretion possesses a morbid intensity of solvent power. It would seem that this condition of the secretion of the stomach is attendant on a disposition to nausea and vomiting, whether spontaneous, or artificially produced; and I cannot help suspecting, that the abuse of fasting, and of sloppy non-nutritious diet, may have considerable influence in producing that condition of the stomach to which I am referring. The greater frequency with which, it would seem, that softening of the stomach occurs in the French, as compared to the English practice, and a careful examination of the cases related by Louis, appear to furnish strong grounds for this conclusion.—A remarkable instance of the concurrence of softening of the stomach with protracted fasting was furnished in the case of the dog which was the subject of Dr. Blundell's experiments on transfusion. This animal had been kept for about three weeks wholly fasting, during which time he was effectually nourished by means of the blood of other dogs injected into his veins. At the close of this period, serum, instead of blood, having been accidentally injected, the poor animal died; and on examining the stomach, it was found that a very considerable portion was completely softened.

The varieties of colour which have been noticed in the cases of softened stomach appear completely in accordance

with the opinion which I have been advocating. I have already stated, on the authority of Billard, that the natural and most healthy colour of the stomach is pale, or nearly white; but that, from disease and other causes, it often assumes other colours, in various shades of intensity. The white mucous membrane, and equally white subjacent cellular membrane, when softened so as to have acquired a ropy glairy consistence, must be very apt to present a certain degree of translucence, and to appear of a slightly bluish tinge. A similar effect is sometimes produced in the substance of the brain when recently softened, without any morbid determination of blood to the part having previously taken place. The other shades of colour are equally explicable, on the supposition that the softened portion had acquired its particular colour before the work of solution or softening had commenced.

OF MALIGNANT DISEASE AFFECTING THE MUCOUS MEMBRANE
OF THE STOMACH.

All the tunics of the stomach may be affected by malignant disease, which may commence either in the mucous or cellular membrane, or it may reach the stomach by extension from neighbouring organs. In advanced cases, all the textures are affected, and the appearances and symptoms do not greatly vary; whatever may have been the seat of the primary affection. Hence it is not always easy to determine in which of the textures the disease commenced. I shall therefore defer, for the present, the description of those cases in which the affection has become extensive and severe. Malignant disease, especially affecting the mucous membrane of the stomach, may be observed under three or four different forms. You will probably recollect my having described, in my general observations on the derangements of the mucous membranes, a particular form of malignant disease, consisting of minute but short filaments, enlarged and blunt at their free extremities; sometimes single but

In slender
filaments &
cauliflower-
shaped
growth.

more often presenting several filaments branching from a single pedicle. Though this form of disease is occasionally met with in the urinary bladder, the trachea, and some other cavities lined by mucous membrane, in which the surface of the membrane is protected from the attrition of foreign bodies, it is rare to find this form of disease in the stomach; in which, from the nature of its function, this cause cannot fail to exert a strong influence in preventing the minute and tender growths which characterize this form of the disease. It is, moreover, by no means improbable that this or some similar form of malignant disease may attack the mucous membrane of the stomach; and be overlooked, for want of precautions necessary to render the state of the membrane conspicuous.

The most decisive of these methods consists in very carefully washing the stomach from its contents, and then pouring a small quantity of clear water upon the mucous membrane, and allowing it to remain; covering the surface in sufficient quantity to float the tender flocculi of which I am speaking. By this means I have observed a pretty extensive but minute development of this form of adventitious growth on the mucous membrane of a cancerous stomach.

In the Autumn number of the Edinburgh Medical and Surgical Journal for the year 1835, some cases of malignant disease of the stomach are recorded, which appear to have been of the fungoid character, and to have been allied to the form of disease last described, but on a much larger scale. In one case, that of a man sixty-three years of age, the mucous surface of the stomach was extensively covered with growths having a cauliflower appearance: there was, likewise, an ulcerated perforation, communicating with a cavity situated between the liver and stomach. In another case, that of a man fifty-five years of age, a large cauliflower-shaped tumour surrounded the cardiac orifice: and in the third case, that of a man sixty-nine years of age, a fungous tumour was found in the same situation. It may be suspected that

disease about the cardiac orifice originated in a glandular structure, and the doubt cannot be conclusively settled; yet the character which these growths appear to have possessed is rather opposed to this idea, whilst their situation near the termination of the epiphelium is rather in favour of their belonging to the mucous membrane.

Warty.

Another form of malignant disease affecting the mucous membrane of the stomach bears a close analogy to warty fungus of the skin. In the early stage, a small portion of the membrane, having a defined rounded figure, is slightly but sensibly elevated, and considerably indurated. It has a close inelastic texture, in which the peculiar structure belonging to adventitious growths of this class is so indistinct as to be rather inferred than actually demonstrated. It would appear that ulceration readily affects the surface of the mucous membrane thus diseased. The surface so ulcerated is pretty smooth, even, and resisting; and is bounded by a slightly elevated edge, near to which it is not uncommon to find small well-defined warty indurations, similar to those by which it may be supposed the original ulcer commenced. I have seen the edge of a malignant ulcer of the stomach, which appeared to be allied to the form just described, so elevated as to form a margin of at least one-eighth of an inch in height, and about a quarter of an inch in breadth, and bearing a resemblance to some forms of cancer of the lip.

Gum cancer.

Another form of malignant disease of the mucous membrane of the stomach affords an illustration of a remark which I have already had occasion to offer in a former Lecture—that the character of an adventitious production appears, in some degree, to be influenced by that of the neighbouring mode of nutrition or secretion; and, that as melanosis appears to be favoured by the natural production of black pigment, as in the examples of melanosis of the eye in man, and about the anus in horses, so the gelatinous, colloid, or gum cancer appears to be a form to which the mucous

membranes, and parts immediately adjacent to them, are more particularly liable. In the stomach, I have seen this form of disease in at least two varieties. In the first, the mucous membrane appears pale, semitransparent, and greatly thickened; and the surface appears covered with widely-spread large granulations of the same colour. When the coats of the stomach are cut through, we see the sides of the cellules, in which the thick mucoid secretion is lodged, forming striæ, more or less nearly at right-angles with the contractile fibrous coat, which is generally greatly thickened, and likewise pale and translucent, in consequence of the peculiar infiltration which I have already noticed, and to which I shall again have to call your attention. This form of disease may affect a very considerable portion of the stomach; and in some of the preparations in the Museum, about the greater part of the pyloric half of the stomach is greatly thickened from this cause. In another variety of this form of cancer, the individual cellules containing the transparent mucus are much more distinct and defined; and may be compared to frogs' spawn without the black spots, or to small grains of sago boiled to transparency, thickly sprinkled over the greater portion of the mucous membrane, which is not so remarkably thickened as in cases belonging to the preceding variety. I have had an opportunity of seeing, in company with my friend John Smith of St. Mary Axe, a remarkably good specimen of this form of disease, in the stomach of a female advanced beyond the middle period of life, whose occupation had been that of nurse, and who had, for some time before her death, laboured under frequent sickness and other symptoms of gastric derangement. Its appearance is well shewn in a very successful drawing by C. J. Canton.

OF THE MUCIPAROUS GLANDS OF THE STOMACH.

Before attempting to describe the morbid appearances met with in the stomach which seem to depend on the

Question as to the existence of follicular appendages.

follicular apparatus, it will be necessary to devote a little attention to the consideration of what is the condition of this mucous membrane, with respect to follicular appendages. Special anatomists are by no means agreed with respect to the extent to which this organ is provided with this kind of apparatus. Whilst some consider that it is unprovided with mucous glands or follicles, except at the cardiac, or perhaps also at the pyloric orifice; others believe that the whole surface of the lining membrane of the stomach, is furnished with them. This discrepancy of opinion is not so surprising as it will at first appear. The glandular or follicular apparatus belonging to mucous membranes is, in various situations, often so extremely obscure, that it may be looked for in vain in some situations in which its existence can admit of no question. This is often the case with the glands of Brunner in the small, and occasionally in the large intestines. Even the glands of Payer, notwithstanding the extent of surface which they occupy, can sometimes scarcely be discovered, even by those who are accustomed to see and search for them. It need not, therefore, be surprising that a follicular apparatus, if it exist in the stomach, shall sometimes be wholly imperceptible, when we consider the great varieties in the appearance which the mucous membrane of this part of the alimentary canal presents. Another cause for the discrepancy of opinion on this subject is, I believe, to be found in the fact, that there is a peculiar character belonging to the glandular apparatus of different parts of the mucous system: hence if they are sought in the mucous membrane of the stomach with a preconceived opinion that they are of a particular character, they may be overlooked if they present one that is widely different from it. We know that some follicles are extremely deep in proportion to their aperture: this is strikingly the case with the lacuna magna of the urethra. In some other situations, the follicles present dimensions which are inconsiderable both in depth and breadth; whilst in other situations

the opening is wide, but the depth extremely shallow. This last conformation may be seen in the trachea and bronchi, and also in the pharynx: it is often strikingly the case with the follicles of the amygdalæ. If, with these considerations present to our minds, we examine the mucous membrane of the stomach in search of glandular or follicular apparatus, we shall not hastily come to the conclusion that they do not exist, because our search may have frequently been made in vain. We know that this kind of appendage to the mucous membrane is frequently indistinct or imperceptible, in accordance with different states of activity of function, independently of disease; and the difference is much greater when we admit the effects of disease into our range. We may see this in the colon, where we may have a complete acne; but it is most remarkable on the common integuments, which in their follicular appendages bear a close resemblance to the mucous membranes. The follicles in the scalp are of almost imperceptible smallness, yet by the morbid retention of their contents they may be distended to the size of an orange.

In the stomach, the glandular appendages to the mucous membrane are sometimes, without the assistance of any disease to render them preternaturally apparent, sufficiently evident about the cardiac orifice, very near the termination of the epiphelium. When exposed from beneath the mucous membrane, they appear, if they have been allowed to be moistened with water, like small semi-transparent rounded bodies, of about the size of a millet-seed, bearing very close resemblance to the labial glands. I have not been able to distinguish their follicular cavities, nor the orifices by which their secretion escapes. I have often sought in vain for glandular appendages to other parts of the mucous membrane of the stomach; not even excepting the pyloric extremity in which their existence has been particularly stated. Nevertheless, I am by no means prepared to deny the existence of such appendages: indeed, there are

Some appearances mistaken for follicles.

some morbid conditions of the stomach, by which I conceive that their existence is rendered more than probable. Certain appearances are by some believed to be indications of follicles, which I conceive ought not to be regarded as really possessing this character. My friend Dr. Carswell appears to consider those elevations, which, when in a state of hypertrophy, give to the mucous membrane of the stomach the character which Louis has designated *mamelonné*, as the follicles of the stomach; and the red spots, which he has accurately depicted as sometimes occupying their centres, he regards as the orifice of these follicles. Though I do not adopt this view, I cannot but admit that the appearance of these elevations sometimes bears a very striking resemblance to enlarged follicles. The mucous membrane of the stomach appears to be itself fully adequate to the production of mucus. Its follicles, if it possess any, are probably designed to bestow some peculiar properties on the juices of the stomach: we may therefore expect to find their situation occasionally pointed out by indications of a peculiar secretion at particular parts; and it is the fact, that we occasionally meet with such differences in the stomach, rather than the actual demonstration of a follicular structure, on which I ground my belief of its existence. I have more than once had occasion to observe the mucous membrane of the stomach sprinkled with spots of a brownish colour, of a circular or oval figure, of a small but not uniform size, varying from that of snipe-shot to that of a small peppercorn. On close examination, these spots appear to consist of very slight depressions, bounded by well-defined edges, inclosing a smooth and even surface, which, though presenting the discolouration before mentioned, had no appearance of ulceration or other erosion. In fact, they appeared like extremely shallow follicles discoloured by ecchymosis, the sanguine colour having been converted into brown: such, indeed, I conceive them to have been. They were neither collected in clusters, nor, on the other hand,

Reasons for admitting their existence.

equi-distantly placed ; yet there was a certain degree of uniformity in their dispersion over the greater part, not to say the whole, of the internal surface of the stomach on which they occurred. I am the more disposed to consider that these spots on the mucous membrane of the stomach indicated a natural peculiarity of structure of the follicular character, from having seen, in the small intestines, spots in some respects similar sprinkled over the mucous membrane, and in number and position representing the situation of the solitary glands, although they could not positively be seen to have their existence in those structures. Another morbid appearance sometimes met with in the mucous membrane of the stomach, which tends to give support to the idea that it is not without its follicular appendages, is the occurrence of spots, varying in size and depth, but in both these respects exceeding the spots which I have last described, in which the mucous membrane appears to be wholly or partially removed by what appears to be solution, rather than ulceration. In the deepest of these spots, the sub-mucous cellular membrane is exposed, of a bluish-white colour, unaltered in texture, but perhaps somewhat reduced in thickness. In the shallowest spots—and these are generally of the least diameter also—the mucous membrane appears depressed and reduced, yet not so as to expose the subjacent tissue : the surrounding mucous membrane forming the edges of these depressions, as well as in the spaces between them, appears perfectly unaltered, being neither thickened nor injected, nor more nor less than naturally moveable upon the subjacent coat. It may be said that these spots look like the result of partial cadaveric softening ; and this idea I am quite disposed to adopt ; but I cannot help considering that there must have been, previously, not only a peculiarity of structure, but also a peculiarity of secretion, to determine this strikingly partial effect : indeed, it seems more than probable that the change must have made some commencement even before death ;

seeing that had the solution merely depended on the operation of the secreted solvent fluid upon the stomach after the extinction of life, it would, as in most cases of cadaveric softening of the stomach, have assumed a diffused character. The view which I am taking, as to the nature of these spots, appears to be favoured by the fact, that the kind of softening which I have just described, as well as the ecchymosed spots before spoken of, appear mutually to confirm each other, as to the character and distribution of the suspected structures. With this opinion—which I state rather as conjectural, than confirmed—I am not surprised at our inability to discover, as appendages to the mucous membrane of the stomach, either deep follicles like the *lacuna magna*, or even structures like the aggregate or solitary glands of the intestines. I have sometimes imagined that the follicles of the stomach, if we admit the appearances which I have described to be connected with such structures, are nothing more than slight depressions, circumscribed by those elevations which I have already spoken of as being extremely variable as to their degree of conspicuousness, sometimes acquiring an exaggerated development, but, at others, so completely receding, as to be nearly or quite imperceptible.

Their probable character.

Besides the two morbid appearances of which I have already spoken, as probably connected with a follicular apparatus, I may observe, that the small ulcers which we sometimes find on the mucous membrane of the stomach appear, in some instances, to have commenced in slight depressions, such as I have been mentioning.

Possibly of more than one kind.

It is quite possible that the mucous membrane of the stomach, instead of being wholly unprovided with glandular appendages, as some have supposed, may, like other portions of the mucous system, be furnished with more than a single class of these bodies. This idea receives some support from the following fact. Whilst I was engaged in some experiments on poisons, on behalf of the British Associa-

tion, I observed some appearances in the stomach of a dog, which favoured the existence of follicles, though not precisely of the character which the appearances already described to you would indicate. The dog had been poisoned with oxalic acid. In addition to other appearances which I may hereafter have to notice, I observed numerous opaque white spots, which I could imagine to be nothing else than follicles which had become preternaturally conspicuous amidst the surrounding altered mucous membrane. I have since, on two or three occasions, met with similar spots in the human stomach. They were evidently different from the spots which I formerly mentioned as sometimes visible in acute inflammation of the stomach, being larger, and less numerous. In their number and distribution they more nearly resembled the ecchymosed spots and small ulcers last alluded to, but were more scattered and more decided bodies.

I do not remember to have seen, or even to have heard of any morbid alteration of the small glands which I have already spoken of, as existing about the cardiac orifice; unless some of the malignant or cancerous affections, which take place at this part, are to be referred to them. I have never seen cancer at the cardiac orifice in a sufficiently early stage to admit of my drawing any conclusion in this respect; yet analogy, with some other parts similarly circumstanced as to structure, such as the mouth, a part of the pharynx, and more especially the *os tinæ*, seems strongly to favour this idea. Whether the cancerous affections which so much more frequently take place at the pyloric extremity can ever be referred to a glandular or follicular structure, or not, I confess I am not able to determine: all that I have been able to make out respecting them, is, that they sometimes belong to the mucous membrane, and sometimes to the sub-mucous cellular membrane: and as such affections of the pylorus must be spoken of under both these heads, I need not say any thing further respecting them at present.

OF THE SUB-MUCOUS CELLULAR MEMBRANE OF THE
STOMACH.

Anatomical
characters.

The cellular membrane by which the mucous lining of the stomach is connected to the contractile fibrous coat has, by some anatomists, been distinguished as constituting a separate coat, and described as the nervous coat. It has not, as is now generally admitted, any claim to this appellation: nevertheless, it forms a very important element in the structure of the stomach in its healthy state, and is also the seat of several morbid affections to which this organ is liable. It appears to consist of two portions: the one remarkably thin, loose, and mobile, which is immediately beneath the mucous membrane, to which it gives its remarkable mobility, as well as the capability of being thrown into numerous plicæ, of variable, but often of large size. The second portion, which is thin, but of a much more condensed character than the former, is in contact with the contractile fibrous coat, to which it acts like a kind of fascia. This arrangement of the cellular membrane is much less striking than in the case of the œsophagus. The sub-mucous cellular membrane is sometimes so small in quantity, and so attenuated, as to allow of the fibres of the contractile coat being distinguished, by producing a slight elevation of the mucous coat: at other times it is considerably thickened, contributing materially to the substance of the parietes of the stomach.

Emphysema.

The first morbid appearance which I shall notice, as connected with this coat, is emphysema. This is by no means a common affection. I have only seen it once or twice. Billard, who saw and described it, has given very few cases of it. It is, I believe, always a very partial affection. The small portions of mucous membrane raised by this state of the sub-mucous cellular tissue bear some resemblance to the froth of soap-suds. It has seemed to me more than usually transparent; and I have neither seen nor heard of any trace of inflammation or irritation appearing to be connected with it. It might well be queried, whether the air so situated

had not been introduced by some mechanical lesion, occurring either before or after death; or otherwise be owing to decomposition, had not both of these causes been clearly out of the question in the cases to which I refer.

The sub-mucous cellular membrane is sometimes infiltrated with serum, constituting œdema of this structure. This may take place in two ways. First, it may accompany acute diffused inflammation of the mucous membrane. I do not remember to have seen it exist to any considerable extent, from this cause; yet it is probable that it is always present to a slight degree, accompanying lacerability of this structure, which is by no means unfrequent where the mucous membrane has been affected. Secondly, œdema of the sub-mucous cellular membrane generally takes place to a much more considerable extent under the operation of those causes which produce more or less general anasarca apparently of a passive character. Thus we meet with it in patients who have laboured under serious organic disease of the heart; when it is apt to concur with a considerable, but non-inflammatory injection of the mucous membrane itself. It may also take place in conjunction with ascites; but I think that, in these cases, the œdema of the sub-mucous cellular membrane of the stomach is not so striking as the similar state of the cellular membrane in some other parts of the canal.

œdema.

Inflam-
tatory, and
non-inflam-
matory.

This œdema has been adduced as one of the circumstances which may lead us to distinguish the non-inflammatory or congestive injection of the mucous membrane of the stomach from the inflammatory form. It appears to me, however, that the distinction is not one on which much reliance can be placed; since, though most frequently and remarkably occurring, not as the result of inflammation, it may certainly concur with, and be produced by, that state. Billard has adopted the same conclusion, which he has supported by several cases. The different degree of lacerability may, I believe, afford a presumptive though not a conclusive distinction

between the two forms. We may distinguish œdema of the sub-mucous cellular membrane of the stomach, by observing, first, that there is a considerable increase of thickness of the parietes of the coats of the stomach; that when these coats have been cut through, this increase of thickness appears to depend on a deposit between the mucous membrane and the contractile fibrous tissue; and, most conclusively, by the expression of serum from this situation, when a portion of the stomach is compressed between the thumb and finger.

Inflam-
mation.

Although the sub-mucous cellular membrane of the stomach is undoubtedly liable to inflammation of the plastic as well as of the non-plastic form, yet it is very rare for us to have the opportunity of observing the appearances of the plastic form of inflammation of this part. The most convincing evidence of its having existed, is met with in cases of hour-glass contraction of the stomach, in which it has formed a thick white condensed layer: in fact, the hour-glass contraction of the stomach is very much promoted, if not in some cases wholly produced, by the contraction of the effused lymph on its becoming a permanent structure, in conformity with the principle to which I have so often referred, in the course of these Lectures: nevertheless, I am quite disposed to believe, that, in the majority of cases, the hour-glass contraction of the stomach owes its origin to irregular and partial contraction of what is called the muscular coat, at or near the middle of the stomach; the derangement of the sub-mucous cellular membrane, by which this contraction is rendered permanent, being the result of the irritation which that irregular action had occasioned.

Plastic.

Partial in
hour-glass
contraction.

The seat of
adventitious
growths.
Analogous.

The sub-mucous cellular membrane is the most common seat of the adventitious growths by which the healthy state of the stomach may be disturbed. These may be of the analogous, or of the heterologous character: to the former belongs the partial production of fat, closely resembling that which is met with in the ordinary adipose cellular membrane. I once

met with a circumscribed flattened body, scarcely so large as the bowl of a tea-spoon, situated beneath the mucous membrane, at no great distance from the pylorus. Its structure was dense and compact, but composed of minute granules, united by cellular membrane. It bore a very considerable resemblance to the structure of the pancreas; so much so, that I sought for a duct or its branches, but without success. It might, probably, have consisted of a portion of adventitious adipose membrane, which had undergone some material alteration of character. Collections of hair and fat are reported to have been found beneath the mucous membrane of the stomach; and I conceive the layer of cellular membrane, of which I am now speaking, to be the structure in which it is mostly likely that these anomalous formations took their origin. They may, it is true, have grown from the mucous membrane itself, and, as their size increased, have occupied the situation of the cellular membrane.

Fat.

Encysted
collections
of fat and
hair.

I must reserve the remarks which I wish to make respecting the origin of those remarkable anomalous productions until I come to speak of the ovaries, in which their formation is much more frequent than in any other organ: yet I would observe, that their occurrence in connection with the stomach, not less than their being found in the bodies of males, indicates that they cannot be regarded as always the result of impregnation.

The most frequent, as well as the most important adventitious productions taking place in this part of the texture of the stomach, are unquestionably those of a malignant character. These may take their origin in this structure; or may be propagated to it from adjoining parts, which have been previously invaded. They may occur as distinct encysted masses of various sizes, and evidently possessing a structure dependent on that mode of formation on which I have so often insisted. They may also occur in an infiltrated form, when the greatly thickened sub-mucous cellular membrane forms a layer of greater or less extent, consisting

Heterolo-
gous.

of the adventitious structure in question. The first of these forms will invariably be found where the disease has commenced in the sub-mucous structure, provided its character has not been destroyed by softening and ulceration.

Malignant tumours in this situation may not unfrequently be discovered by the touch or careful examination of the abdomen; and on this account, as well as from the symptoms which attend them, they may be confounded with scirrhus enlargement of the pylorus; since it has been observed, that, in some of these cases, the part of the abdomen in which the tumour has been felt has afforded rather deceptive evidence. It is obvious, that the distinction is of little importance as respects the patient, and I merely offer the remark as a caution in diagnosis.

Malignant
of several
varieties.

Tumours of various kinds, and under different names, are spoken of by authors, as having been formed in the coats of the stomach. Most of these, I apprehend, take their origin in the sub-mucous cellular membrane; for where this is not expressly stated, the characters of the tumours, as they are described, seem to point them out as belonging to that tissue. Notwithstanding the different names which have been employed, and the attempts which have been made to establish them as constituting distinct diseases, it appears to me that they may all be regarded as malignant, or cancerous, in the more extensive signification of this word. Thus, besides true scirrhus, we hear of the milt-like tumour, the anomalous tumour, the medullary sarcomatous tumour; all of which appear to be merely varieties of the fungoid disease, possessing, like all other malignant productions, when sufficiently recent and entire to admit of examination, evidence of that mode of formation which is common to all these structures, yet to be distinguished from true scirrhus by the larger size of their component cysts, by their softer though by no means uniform consistence, and by the different degrees to which they are injected with blood or otherwise discoloured, or by the milt-like or brain-like appearance which they sometimes wholly

or partially present. I have already remarked, in my observations on this class of diseases, that considerable latitude must be allowed, both in colour and consistence, to those tumours which we may regard as the result of fungoid disease;—that they cannot be considered as more than mere varieties; and that we may find two or more of them associated in the same subject, and even in the same tumour: nevertheless, it must be admitted, that, in individual cases, one of these varieties may either exist alone, or decidedly predominate.

When heterologue malignant tumours are formed in the sub-mucous cellular membrane of the stomach, they may acquire a considerable size before the mucous membrane which covers them appears to be implicated in the disease: it is, however, distended by the adventitious growth, which sometimes projects, as a nodulous tumour, into the cavity of the stomach. There is considerable difference in the form which these tumours assume, according as the adventitious structure is collected into a mass at a limited spot, or occupies a more considerable portion of the parietes of the stomach without acquiring much thickness at any part. When the mucous membrane is distended by a large nodulous mass of this kind, it gives way, in one or more places, to ulcerative absorption, and the adventitious structure is thus made to communicate with the interior of the stomach. The mucous membrane does not, when first penetrated by ulceration, appear to participate in the malignant character of the structure beneath it; but it becomes subsequently fixed to the tumour, by the changes which are going on in the subjacent cellular structure about the adventitious growth; and the ulcerated mucous membrane then begins to partake of the malignant character, and acquires a characteristic elevated and everted edge. A cavity is formed in the adventitious mass, by the softening and breaking down of its structure; and communicates with the cavity of the stomach, by the ulcerated opening which I have described.

Progress of
the disease
when com-
mencing in
this struc-
ture.

This progress of malignant disease originating in the sub-mucous cellular membrane of the stomach is completely analogous to that which takes place in the case of malignant tumour developed beneath the common integuments; just as those forms of malignant disease which commence in the mucous membrane itself are analogous to warty fungus or other malignant disease of the skin. In both instances, when the disease has made considerable progress, and the different contiguous structures enter into the composition of the part, and become implicated in the disease, it is by no means easy, and perhaps not very important, to distinguish to which texture the disease seems primarily to belong. Not only is there much similarity in the morbid appearances discovered after death, but the symptoms, the inevitably fatal tendency, and the mode of treatment, must be nearly alike, in all these cases. It is to this circumstance that I refer the vagueness—which has, not without reason, been complained of by Louis, and which has been sensibly felt by myself—in most of the recorded histories of malignant disease of the stomach; most of these being grouped together as cancer of the stomach, without reference either to the probable commencement in one or other texture, or to the different appearances to which they give rise in each. The difficulty of distinguishing those cases which belong more particularly to the sub-mucous cellular membrane, from those of the mucous membrane itself, is most considerable where the adventitious deposit has acquired considerable extent without much thickness. The mucous membrane being removed from the whole or greater part of this extent, its edges present the characteristic elevation; whilst the surface of the ulcer, though considerably depressed below the level of the surrounding mucous membrane, appears shallow, compared with the cavity produced by the softening of malignant structures, when collected in masses. The form of malignant ulceration in the stomach, of which I am now speaking, is seen in several of the pre-

parations preserved in the Museum of Guy's Hospital; and appears to have existed in a case figured in "Dr. Monro's Morbid Anatomy of the Gullet, Stomach, and Intestines."

When malignant ulceration has taken place in the structures composing the stomach—whether the disease commenced in the mucous membrane or in the subjacent cellular membrane, or reached the stomach by propagation from neighbouring parts—the absorbent glands in the neighbourhood of the stomach become contaminated with the disease, and occasionally form masses of large size.

Dr. Monro, Tertius, has particularly described an adventitious structure, which he had met with, in, or attached to, the mucous membrane of the alimentary canal, but more particularly affecting the stomach, to which he has given the name of 'milt-like tumour,' and strongly insists on its being a distinct and peculiar affection. The following are its characters described, in the Doctor's own words:—

The 'milt-like tumour' of Dr. Monro.

"OF THE MILT-LIKE TUMOURS OF THE MUCOUS MEMBRANE.

"This tumour has, as far as I know, entirely escaped the attention of pathologists.

Dr. Monro's description.

"In the former edition, I have called it 'milt-like tumour,' as it resembles, in colour and consistence, the milt of many fishes: and have added the words 'of mucous membranes,' as it grows only from membranes of this description.

"This tumour bears some analogy to the tumour described by my grandfather, under the name of an 'anomalous tumour,' which has been lately called, by Dr. Burns of Glasgow, 'spongoid inflammation;' and, by Hey, of Leeds, the 'fungus hæmatodes.'

"But it differs from this dreadful malady in many of its characters; as will appear in the sequel, by instituting a comparison between these diseases.

"The above disease also bears some analogy to that organic disease of the testes, which has been described by Dr. Baillie under the head of 'pulpy testicle.'

"This species of tumour generally attains so considerable a volume,

as to fill, and even distend to an unnatural size, the bowel within which it is contained, as I have seen in the case of the bladder of urine: but in other cases, this tumour grows from a part only of the mucous membranes.

“ The disease does not prove speedily fatal; for I had occasion to attend a patient who laboured under it for two or three years.

“ The milt-like tumour, in many respects, resembles the milt of fishes: it is of a pale red colour; and it also is nearly of the same consistence, but rather softer; has an irregular surface; and is covered by a thin membrane, upon which there is a number of vessels filled with blood.

“ This species of tumour very readily falls to pieces; and mixes in part with water, forming a turbid mixture: and it becomes somewhat hardened by being put into strong spirits. It adheres but slightly to the organ from which it grows, by a number of small processes, which insinuate themselves into the thickened villous coat. After the tumour has been detached, the villous coat of the diseased bowel assumes somewhat of a honey-comb appearance; and it is besmeared with several drops of blood, derived from the vessels, which supplied the tumour, having been torn.

“ The bowel from which such a tumour grows, betrays marks of inflammation externally: there is evidently an unnatural determination of blood to the seat of the disease, the blood-vessels upon the peritoneal coat being not only larger, but also more numerous than in the healthy state.

“ The neighbouring lymphatic glands also participate in the disease, being much larger than in the healthy state; and they are filled with precisely the same milt-like matter. In a case which I had occasion to examine, the bladder was filled with the milt-like matter; and one of the lymphatic glands at the side of it had attained the size of the fist, so that I at first supposed there had been a morbid contraction in the middle of the bladder: but I found, upon opening it, that there was no communication between the cavity of the bladder and the swelling connected with it.

“ There is another peculiarity in the disease; viz. the emission of a very remarkable and offensive foetor: the organ containing such a tumour is as much discoloured, and emits as foetid a smell, as the same bowel which had been exposed to the air for several days.

“ The veins distributed on the mucous membrane in the vicinity of the tumour are considerably enlarged, and distended with blood.”

“ OF DISTINCTIVE CHARACTERS BETWEEN THE MILT-LIKE TUMOUR,
AND THE ANOMALOUS TUMOUR OF DR. MONRO, PRIMUS.

“ 1st. The anomalous tumour of my grandfather differs, in its situation, from the milt-like tumour. The former has been found in all the tissues of the body: the latter, in the mucous membranes only.

“ The anomalous tumour is sometimes connected with the periosteum; the capsular ligaments, especially with that of the hip-joint; the peritoneum, the liver, spleen, ovarium, and uterus, and with the albuginea and vaginal coats of the testicles; with the coats of the optic nerve, and the sclerotic coat of the eye.

“ In short, the anomalous tumour is not confined to any one texture, but is common to all: it begins as a distinct elastic tumour, without fluctuation; and some parts of it feel harder than others. In its progress, it bursts, and a soft dark purple-coloured fungous excrescence, which bleeds profusely, rises from the centre, and soon increases very rapidly in size.

“ The milt-like tumour is much softer than the anomalous: before it bursts, it has not the same purple colour and firm elastic feeling as the anomalous tumour, which Dr. Burns has compared to a sponge tied up very tightly in a piece of bladder: and I have never observed any appearance of fungous ulceration of the milt-like tumour, nor the same inequality in the consistence of different parts of it, as in the fungus hæmatodes.

“ The tumour is nearly of an uniform consistence in every part; and its lobes are not so distinct as those of the anomalous, which are separated from each other by membranes.

“ The milt-like tumour is, in colour and consistence, uniform in every part; but the section of the anomalous tumour exhibits, in its parts, a different colour, and also a different consistence; some portions being as soft as brain; others, as hard as the yolk of a boiled egg; and others, like cartilage: besides, there are cavities, of different sizes and forms, within the tumour, full of a fluid tinged with blood.

“ The disease I have been endeavouring to describe, appears only in advanced life; but the anomalous tumour is, in many instances, a disease of infancy, of childhood, and of the meridian of life.”

Remarks on
Dr. Monro's
distinction.

I must repeat, that neither in this description, nor in specimens which have more or less closely answered to it, am I able to discover sufficient grounds for regarding the *milt-like tumour* as a distinct disease. It is evidently an affection of a malignant character, and appears to be nothing more than the softest form of fungoid disease, in which the material contained in the vascular membranous cysts has speedily lost its vitality, without receiving blood either by the ramification of vessels or by extravasation. With this understanding, there can be no objection to retain a term which is sufficiently expressive and must save circumlocution.

OF THE CONTRACTILE FIBROUS OR MUSCULAR COAT OF THE STOMACH.

Little liable
to disease.

This tissue in the stomach, as in other parts, is liable to very few diseases which originate in it, but it occasionally participates in some which extend to it from other tissues: thus, it is liable to be destroyed by ulceration; with which it may be affected in consequence of ulceration having previously taken place in the mucous membrane. The serous membrane, in such cases, is necessarily incapable of remaining long by itself; perforation, therefore, speedily follows: but the aperture through this last coat is, in general, very much smaller than that which has been made through the mucous and contractile fibrous coats: this, however, does not prevent the most sudden invasion of intense peritonitis, by which the patient is generally cut off in a very few hours. In these cases, some of the contents of the stomach are found mixed up with the production of inflammation of the peritoneum.

Remarks re-
specting this
coat, &c.

This fatal result of ulceration, through the contractile fibrous coat of the stomach, is sometimes averted, by the firm adhesions which the stomach at this part contracts with the adjoining structures. As I have already mentioned the partial deficiencies of the stomach produced by these ulcerations, it is needless that I should say much respecting

them on this occasion. I cannot, however, wholly pass them by; since they appear to evince a peculiarity in the mode of action in the coat which we have now under consideration. The fact, that adhesions may be formed where large and extensive destruction of the stomach has taken place from ulceration, appears to indicate that the stomach, at the part, has ceased to contract, and consequently to be put in motion; otherwise, the attempts at adhesion would be unavoidably frustrated. It is equally obvious, that the contractions of every part of the stomach had not been suspended: the occasional vomiting, and the daily passage of ingesta, even in small quantities, sufficiently attest that these contractions do take place: we are therefore reduced to the necessity of believing that one portion of the contractile fibrous coat may be at rest, whilst another is in action. This mode of contraction is another feature by which the sub-mucous fibrous contractile tissue is strikingly distinguished from that of true muscle; in which, I believe, we never find a diseased muscle at rest in one part, and in action in others. In fact, where partial contractions of muscle are required, provision is made for them by the interposition of a different texture: we see this in the Rectus abdominis. The contractile fibrous coat of the stomach is somewhat more complicated in the disposition of its fibres, than is the case with this tissue in other parts of the alimentary canal; there being three, instead of two orders of its fibres. By their combined action, they adapt the capacity of the stomach to the bulk of its contents; and give that motion to the mass of food undergoing digestion, which tends to bring a continually varying surface into contact with the different parts of the lining membrane, and thereby promotes the influence of the solvent juices of the stomach upon the mass of food: it must also be the principal means of forcing the mass of chyme through the pylorus. Although Majendie has endeavoured to shew that the act of vomiting is performed by the abdominal muscles, rather

than by any motive power in the stomach itself, I confess that I am disposed to believe, that, in ordinary cases of vomiting, the contractile coat of the stomach performs a very important part. The peculiar kind of pain which precedes the act of vomiting, as well as the manner in which it takes place, seems perfectly accordant with this idea: in fact, I conceive that the action of the stomach, in vomiting, is like that of the uterus for the expulsion of the foetus and placenta. The contractions of the abdominal muscles evidently and powerfully co-operate in both these cases; but no effort of these voluntary muscles can alone effect either parturition or vomiting. It seems extremely probable, that the partial contraction of the fibrous coat may occasionally divide the stomach into separate chambers, and thereby, for a time, give to the simple stomach of man somewhat of the character of the more complicated stomachs of some other animals. This idea has been insisted upon by Sir Everard Home, as the explanation of the production of the hour-glass contraction of the stomach: it also seems to be supported by the fact, that the act of vomiting frequently does not appear to throw off the contents of the stomach indiscriminately, but some matters are retained whilst others are rejected: thus it is by no means uncommon to see tepid water, thin gruel, and even the too abundant watery secretions of the stomach itself, rejected in a nearly or quite unmixed state; although a subsequent effort, made a short time after, leaves no room to doubt that undigested food had been in the stomach at the same time. This division of the stomach into chambers must be effected by the contraction of the circular, rather than of the two other orders of the fibres; and it seems to be by no means improbable, that the superior strength and activity necessarily associated with these fibres may probably be regarded as a reason for the irregular contractions of these fibres being also the most conspicuous: hence, we have not only the hour-glass contraction before alluded to, but also, occasionally, the con-

traction of the whole or part of the pyloric half of the stomach, so as to give it the appearance of a portion of intestine. I am not, however, prepared to go the whole length with Sir Everard Home, in regarding the hour-glass contraction of the stomach as nothing more than a natural contraction rendered permanent. The altered condition of the mucous and submucous structures, which I mentioned in my last Lecture, is evidence of the degree and extent of the diseased process set up at the part. Where a partial contraction of the stomach is merely the result of an irregular effort of the contractile coat, the constriction may be overcome after death, and the parts present a perfectly natural appearance; but such cannot be the case when derangement of the other structures has taken place.

Hour-glass
contraction
of the sto-
mach.

The contractile coat of the stomach is sometimes extremely thin, in common with other coats of the stomach; but I am not aware of this having ever existed so as to constitute an essentially morbid condition. The tenuity is sometimes so great that the fibres are scarcely perceptible; in other cases, the deficiency is partial, and distant fibres are seen, with spaces between them. This has been particularly noticed by Louis. The opposite state, in which this coat is preternaturally thickened, not very unfrequently exists as a morbid condition. The thickening of this coat, as I have already hinted, may take place in two ways:—1st, A true hypertrophy sometimes takes place where the stomach is frequently distended by inordinately bulky meals, as well as where a constriction of the pylorus has caused an increased power for the propulsion of the food. In hypertrophy of this kind, the increase of thickness of the muscular coat is general, rather than partial: the cellular membrane and other textures of the stomach are not necessarily deranged, and, more especially, the mobility of the different coats is not necessarily impaired. The structure of the fibrous coat itself is but little altered; except that its fibres may be somewhat more distinct, and possessed of a little

Deficiency
or thinness
of this coat.

Thickening
or hyper-
trophy.

more colour, which, however, never exceeds very pale rose-red. True hypertrophy of the muscular coat of the stomach, such as I have just described, is, I believe, but seldom met with in this country, at least except to a degree which can scarcely be regarded as morbid.

Professor Louis has given a memoir on the thickening of this coat in conjunction with cancer of the pylorus. It is illustrated by two well-marked cases. I assisted my late friend, William Cox, who was one of the most zealous pathological anatomists whom this school has produced, in the inspection of a patient of Dr. Back's, when he was assistant physician. This patient had long laboured under scirrhus of the pylorus. The coats of his stomach, which was so much enlarged as to reach the pelvis, were greatly and universally thickened.

Partial
thickening
at and near
the pylorus.

There is sometimes a partial but very evident thickening of this coat, at and in the immediate vicinity of the pylorus : it does not appear, however, to be of the kind which I have been describing; nor, on the other hand, is it to be regarded as scirrhus, although liable, from its colour and firmness, to be confounded with it. It is evidently connected with the office of the pylorus, which it keeps in a state of permanent, and frequently considerable, contraction, sometimes not allowing the passage of a moderate size goose-quill. The kind of contraction accompanied with alteration in the structure of the fibrous coat at the part, whilst it is to be carefully distinguished from scirrhus on the one hand, must, on the other, be as carefully distinguished from that contraction which we much more frequently meet with in making inspections, and which appears merely to depend on this coat having been in a state of contraction, perhaps spasmodic, at the time of death. In these latter cases, though the pylorus may be very closely contracted, so as nearly or quite to obliterate the passage, comparatively slight resistance is offered, and the passage is readily dilated to nearly or quite its natural size; but in the cases of permanent con-

tractions, of which I am speaking, such dilatation is impossible. Although the fibrous coat is thicker, and more dense than natural, for the space of about an inch, or even less, the extreme constriction may be limited to a very small place, having the appearance of being formed by a kind of connivent valve, occupying the entire circumference of the passage; yet, from its rigidity, it appears to be something more than a mere fold of mucous membrane, like the true *valvulae conniventes* of the small intestines. In a case of this kind, of permanent, but not malignant contraction of the pylorus, which occurred in this hospital, the patient, a female of about thirty years of age, had for years been affected with severe and distressing dyspeptic symptoms, which, though by no means uniform in their intensity, received little or no alleviation from medicine; yet she remained for years without emaciation, or exciting, by the expression of her countenance, the idea of any severe visceral disease. She had a good deal of morbid irritability, which appeared to be of an hysteric character. She died rather suddenly, shortly after leaving the hospital, in which she had remained, nearly in the same state, during the greater part of her malady; first as a nurse, and subsequently as a patient.

I conceive it probable that such cases may be occasioned by an inordinate sensibility or irritability of the pylorus, calling it into too frequent and inordinate action, producing something more than merely increase of development, but also the deposition of coagulable lymph in a permanent and compact form amongst the fibres: at the same time, I must confess, that not only this morbid state of the pylorus, but also the healthy one from which it deviates, requires the further investigation of the intimate structure of the part.

Although I am satisfied of the non-malignant character of the state of the pylorus which I have just been describing, yet it must, I believe, be regarded as producing a very considerable predisposition to scirrhus and other malignant affections, by exposing the part to injury, from the

various articles which pass the pylorus, and meet with unusual resistance from it.

Thickening
from infil-
tration of a
malignant
character.

The other form of thickening of the contractile coat appears to be directly the result of malignant disease, producing an infiltration into the fibres themselves; and must be carefully distinguished from the true hypertrophy of this tissue, which, indeed, may sometimes concur with malignant disease at or near the pylorus, but is not itself of a malignant character, but the result of the indirect operation of that, in common with other causes, which call for increased exertion of contractile force.

The malignant infiltration or thickening of the contractile coat is much more frequently partial than general; being often pretty much confined to the neighbourhood of that part at which the malignant disease exists in the mucous membrane or cellular tissue subjacent to it, and to which it appears to be altogether secondary; except that, in some instances, it may occur as the extension of malignant disease, commencing externally to the stomach, and proceeding, by extension, to that organ; as is sometimes the case when malignant tubercles exist in the liver, or about the absorbent glands at or near the head of the pancreas; in which case it is probable that the fibrous coat will be affected before the parts internal to it.

When we cut through a portion of stomach in which this infiltration exists, we find the contractile coat considerably thickened, in some instances to a third of an inch or more, yet perfectly distinguishable from the other textures, whether they be diseased or not, except where ulceration may have extended to it. It is very nearly colourless, with perhaps a very little inclination to pale dingy yellow or blue: it is rather translucent than opaque, and is traversed by numerous pretty-uniformly-distributed striæ, passing from the internal to the external surface in general, very nearly at right angles to the mucous coat. These striæ are very evident and characteristic; and have,

I believe, been insisted on by most authors who have described the pathological appearances of cancerous affections of the stomach: they are generally described as membranous septa; and are evidently occasioned by the cellular membrane by which the bundles of fibres are united. That part of the contractile coat in which this infiltration exists, is not merely thicker than usual, but is also preternaturally firm and rigid. The neighbouring parts being likewise infiltrated, have also lost more or less of the mobility amongst themselves, which the laxity of the healthy cellular membrane readily admits. This constitutes a striking difference between thickening from malignant infiltration, and simple true hypertrophy, resulting from increased exertion of the contractile coat.

The stomach can scarcely be mentioned as the seat of parasitical animals. Strongyli have been known to affect the mucous membrane of the stomach in birds: *æstri*, it is well known, are common in the stomach of the horse, the proof of which may be seen amongst the preparations in the Museum: but I am not aware of any parasitical animals of which the human stomach can be regarded as the habitat. They may occasionally exist in it after quitting some other part. Meckel says that they are only there by accident, and that in most cases this only takes place after death. There can be no doubt, however, that they may reach the stomach during life, and be rejected by vomiting. Hydatids may pass from the liver; but I suspect that this must be, by means of ulceration, into the duodenum. A portion of *tænia*, including the head, has been expelled by vomiting. The *ascaris lumbricoides* is the worm which most frequently reaches the stomach. This is easily accounted for, by the locomotive power of the animal. Hence, too, it does not wait to be expelled, but makes its way up the *œsophagus*, and escapes by the mouth or nostrils. My friend Dr. Foville has informed me of a case in which some of these worms were found completely plugging the pylorus. There

Parasitical animals not belonging to the stomach, and rarely found in it.

was no other cause discovered, to account for the sudden death of the patient. *Oxyures vermiculares* are reported to have been found in the stomach. Block says that Wulf found them, in large quantity, in a sac formed in the parietes of the stomach; and Brera, that he found them, in innumerable quantities, in the œsophagus of a woman: but Bremser, apparently with reason, doubts the accuracy of these statements.

Accidental
injuries.

The stomach is liable to accidental injury in various modes. Violence may be done to this organ, either by agents introduced into it, or by external means. The former may act by their chemical properties, as in cases of poisoning through the medium of the stomach; or the effect may be mechanically produced.—I shall, in the first place, solicit your attention to the very important subject of poisons.*

OF THE EFFECTS OF POISONS.

Of poisons.

When we consider the great variety of appearances which the mucous membrane of the stomach may present, independently of the effect of any poisonous ingesta, and which are often quite as striking as those appearances which are met with when poisons have been known to be taken, we cannot but be sensible how fully medical men are justified, when, in cases of legal inquiry, they hesitate to draw any positive conclusions from the state of the stomach itself, and lay the principal stress on the chemical analysis of its contents, as well as of that of the matter which has been rejected by vomiting, and of the articles of which those suspected of having been poisoned are known to have partaken. In this branch of inquiry, great progress has been made of late years; and to no one in this country are we more indebted for it, than to Dr. Christison. Although I do not expect to be able to throw that light on the morbid appearances

Preliminary
considera-
tions.

* The following observations respecting the effects of poisons as exhibited by the stomach were laid before the Medical Section of the British Association, as part of a Report from the Commission appointed by the Association, and consisting of Dr. Roupell and Dr. Hodgkin.

produced by poisoning which will give to them a similar degree of certainty with that possessed by chemical analysis, yet I believe we may reasonably entertain the hope that the various and multiplied experiments in which Dr. Roupell and other toxicologists have been laboriously engaged will do much toward the attainment of this object. Some interesting conclusions appear to me to be pointed to, by the few instances of poisoning which have fallen under my own observation, as well as by the small number of experiments which I have as yet been able to make. These I will now proceed to lay before you.—There are always painful feelings accompanying experiments on inferior animals; yet I trust that, in making them, we may be fully justified on principle, when the object in view promises to be an advantage to man; provided we are careful to seek that end with the least expense of life, and with the least possible amount of suffering. I felt considerable difficulty in making choice of the animals to be the subjects of these experiments, and have endeavoured, as far as possible, to take those lives which for other reasons it was either necessary or desirable to sacrifice. Another point to be kept in view, in selecting the objects of experiments, is, that the animals may be such, that the conclusions to be drawn from them may, with a good degree of analogy, be applied to man. Dogs have, in general, been selected for this purpose; and their size, their sufficient degree of tenacity of life, and their patience under suffering, warrant this choice. I have made some attempts with cats, super-numerary and worthless animals of this species being more easily obtained than in the case of dogs; but their extraordinary tenacity of life, and the readiness with which they reject from the stomach whatever offends it, induced me, after having unsuccessfully attempted to poison four of them with arsenic, to desist from making them the subject of experiment. It appeared desirable to employ an herbivorous as well as a carnivorous animal; and for this purpose

Experiments
on inferior
animals.

I selected the horse, as the most accessible animal of sufficient size : and though his stomach differs materially from that of man, I conceive that the choice has not been an useless one. In conducting the experiments with this animal, I had the advantage of the assistance of my friend Charles Clark, a very able veterinary Surgeon of Giltspur-street.

Description
of the horse's
stomach.

The stomach of the horse, (as has been well stated by my friend Bracy Clark, in one of the articles written by him for *Rees's Cyclopædia*,) though single, may be compared to the more-compound stomachs of the ruminating animals. A large portion, consisting of nearly the whole of the cardiac third, is covered with a smooth but thick cuticle, continuous with that which lines the œsophagus. It is bounded by a thick, well-defined, elevated edge. The portion which succeeds to this, and occupies the whole or greater part of the middle third, is void of cuticle, and differs very much according to the state of the animal at the time of death, and according to the length of time which may have elapsed between the death of the animal and the inspection of its stomach. It may be compared to the digesting stomach of the ruminants. The resemblance is the most manifest, when the animal has been recently killed whilst the process of digestion was going forward : this part of the stomach is then seen to be best supplied with blood. The elevations in the mucous membrane to which I have been alluding, as slightly marked in the human stomach, are here strongly marked ; and exhibit a manifest analogy with the honeycombed surface of the stomach of a ruminant animal, but on a small scale. A considerable quantity of thick mucus is poured out upon this surface, and seems to be the secretion of the membrane itself. When the animal, though recently killed, has not been digesting at the time of death, the elevations in this part of the mucous membrane, though more strongly marked than in the human subject, do not so clearly present the analogy

before spoken of, but are very similar in form and character to those which are met with in man. If the animal have been long dead, and the stomach have become completely collapsed and flaccid, the mucous membrane of the middle third of the stomach becomes so smooth, that the irregularities in its surface are almost imperceptible. The injection of this part of the stomach, in the two states last mentioned, is liable to considerable variety ; which I conceive must, like similar differences observable in the human stomach, be attributed to accidental causes.

The last third or pyloric portion of the horse's stomach, like the middle, presents a somewhat uneven surface ; but the elevations are much less, both in height and extent. In fact, it readily assumes almost an even surface ; it is generally paler ; and the mucus which lubricates its surface is less adherent and tenacious. I have sometimes seen indications of a very distinct follicular apparatus in this part.

OF THE MODUS OPERANDI OF POISONS.

This subject having been made the object of very careful inquiry by my friends Dr. Addison and John Morgan, with the result of shewing that the influence of poison depends rather on a power exerted through the medium of the nerves, or by sympathy, than on the contamination of the circulating fluids by absorption, I have not thought it necessary to direct my attention to it in the experiments which I have made. There was one point, however, which appeared to me to be worthy of attention, in reference to the *modus operandi*, when the stomach is the organ acted upon by poisons ; viz. Are the effects produced to be attributed to the mere injury of the organ, connected as it is with the rest of the system by the most astonishing sympathy ; or is the principal stress to be laid on the specific action of the poison ? The fact, that a number of persons have been killed by drinking boiling water, who have died exhibiting

Reference to the labours of Dr. Addison and J. Morgan.

Distinction to be made between the specific effects of the poison and the peculiar sympathies of the organ.

Experiment
with hot wa-
ter on the
stomach of a
dog.

many of the symptoms of poisoning, shews that the lesion of the stomach without specific influence is a very adequate cause of speedy death: still, I was desirous of ascertaining the degree and extent of the mischief induced by this cause, compared with what takes place when a poison is employed. I therefore had three ounces of water, nearly at the boiling point, thrown, by means of a syringe, into the stomach of a small and young dog. It was almost instantly returned, nearly as clear as when received, and still at a high temperature. After having thus rejected the water, the dog exhibited so little symptoms of uneasiness, that I almost suspected that little or no mischief had been inflicted; but in a short time he made efforts to vomit, and rejected a clear fluid, somewhat frothy, and mixed with a little coagulated secretion resembling lymph or slightly-heated albumen: he continued to repeat similar efforts at various intervals, the matter rejected bearing the same character as before, but occasionally tinged with blood. He appeared, at times, to suffer inconvenience in his throat, but his sufferings did not seem to be very severe: they appeared, however, to be on the increase, rather than on the decline; and about three hours after the water had been given, I found him weak, inclined to remain quiet, and with the upper part of the abdomen remarkably swollen, whilst the lower was as much contracted. The efforts to vomit were less frequent. Though cheerful when noticed, he had become cool and languid. Judging that the lesion of the stomach had now arrived at its height, and that death was inevitable, I had the animal killed by a blow on the head. On examining the stomach and œsophagus, they presented an appearance which has been well represented by C. J. Canton. The œsophagus was of bright red, but its cuticular lining was not detached: its parietes were very much thickened by infiltration with a colourless fluid, constituting true inflammatory œdema, and bearing considerable resemblance to œdema of the glottis which is seen in man,

except with respect to the redness and injection, which in œdema of the glottis are often wanting. The stomach was more intensely reddened than the œsophagus. It was distended with a considerable quantity of transparent but ropy secretion. Its parietes were not much thickened. The redness was far more intense towards the cardiac extremity, where blood appeared to be extravasated as well as injected. Towards the pylorus the discolouration was comparatively trifling.

The situation of the most intense effect produced by the irritation of hot water tends to confirm some observations which I have had occasion to make, in examining the stomachs of persons poisoned by sulphuric acid; and leads me to offer a few remarks on

THE INFERENCES TO BE DRAWN FROM THE SITUATION OF
THE PRINCIPAL LESION OF THE STOMACH IN CASES OF
POISONING.

In the cases to which I have alluded, the principal action of the boiling water and sulphuric acid were observed in the greater curvature immediately opposite the orifice of the œsophagus, rather than precisely at the cardiac extremity, where, in other cases, the most intense injection is generally met with. The repeated occurrence of this fact induces me to suppose, that when an intensely active agent, like the two which I have mentioned, has been swallowed or forced into the stomach, it is, as it were, discharged against that part of the internal surface of the stomach which is immediately opposite the opening; and that upon this spot an almost instantaneous effect is produced, which is deeper and more intense than that which is afterwards produced on other parts of the mucous membrane, when the agent is diffused over them, lowered in its activity by the mucus, which is rapidly secreted, and which does not merely dilute the noxious agent, but in some degree protects the membrane. The fact, that the spot which I have now

The part
first & most
exposed to
fluids.

Poisons
taken in
substance.

Poisons
taken in
solution.

pointed out is not precisely that at which the highest degree of vascularity is generally met with, may induce us to regard the discovery of a morbid appearance at that spot as a ground of suspicion that some fluid capable of producing an immediate effect has been received into the stomach. Even when the noxious agents received into the stomach do not produce the immediate effect which I have noticed in the case of boiling water and sulphuric acid, some inferences may be drawn from the situation of the morbid appearances. If the poison have been taken in the solid form—as, for example, when arsenic has been taken in substance—strongly-marked effects will be produced at those particular spots on which the poison has lain, whilst the intervening portions either escape, or exhibit much less-striking effects. If, on the other hand, the poison be taken in solution, and be not sufficiently intense at once to destroy the power of the stomach, its effects will be found most conspicuous in those parts which, under other circumstances, are the most frequent seat of injection; namely, the cardiac extremity, or even the whole cardiac half and the summits of rugæ. In fact, the inflammation of the stomach produced by an irritating poison in a fluid form, and not acting immediately as an escharotic, appears to resemble that which takes place in the mucous membrane of the alimentary canal when no poison has been taken: at least, the principal difference appears to exist in the superior intensity of the appearances which are occasionally observed in cases of poisoning. It is perfectly consistent with this remark, that we not only find the rugæ of the stomach reddened, especially at their summits, but also the edges of the valvulæ conniventes most intensely injected when the effect of the poison is continued into the small intestines. In the horses which I have had poisoned, the orifices of the biliary and pancreatic ducts, which are marked by slight projection on the internal surface of the duodenum, were similarly reddened. The wax model of the stomach

of a horse poisoned by corrosive sublimate, given in solution, exhibits, in a well-marked degree, the effects of a fluid acrid poison: it is also worthy of attention, that it is not merely the summits of the larger elevations, such as the rugæ of the stomach and the projecting orifices of the ducts, which become conspicuous by their superior injection; the summits of those smaller elevations to which I have called particular attention, in describing the character of the internal surface of the stomach, sometimes become similarly distinguished.

The character of the secretion upon the surface of the mucous membrane will sometimes throw considerable light on the condition of the membrane before death. In the case of the dog which had received boiling water, we have seen that a large quantity of fluid was secreted; since the stomach was found distended with it, and a considerable quantity had also been rejected, by repeated vomiting. Not only the quantity, but the quality of the secretion was altered; for besides the clear and glairy fluid, there was also some opaque and partially-coagulated matter, which appeared to consist of lymph. The fact, that none of this was found in the stomach after death, shews that it did not attach itself to the lining membrane in the form of a false membrane;—the abundance of the fluid secretion, combined with the continued and forcible action of the contractile fibrous coat, having probably been the cause which prevented its doing so. In other instances, when the irritating cause is very active, and remains applied to particular spots, the secretion is rather lymph than mucus, and remains attached to the lining membrane; except under particular circumstances, which I shall have to notice in one of the cases which I am about to relate.

Character of the secretion of the mucous membrane.

The presence of a small quantity of blood in the matter secreted is equally worthy of attention with the production of lymph instead of ordinary mucus. In whatever way the escape of this blood is brought about, it is an

Exporosa-
tion of blood
of two kinds.

evidence of the violence of the injury which the mucous membrane has received. It would appear, however, that it takes place in two modes, which deserve particular attention. In the one case, the vessels seem to give way under the immediate influence of the violence which they receive, as well as from considerable and sudden injection. The hæmorrhage in this case resembles that which takes place from mechanical injury, or, more closely, that from the Schneiderian membrane, which occasionally takes place under violent exertion. In the other case to which I allude, the escape of blood is the result of a more slow and gradual process. It appears to be brought about by the alteration of structure, which takes place as the result of the inflammation which the irritating cause has created. The blood escapes from numerous minute points, at which the redness is most intense; the substance of the membrane having become soft and tender, though somewhat thickened. It is this softening of the texture, the result of inflammation, and which prepares the way for the escape of blood at numerous points, which appears to me to be worthy of particular attention; since it seems quite analogous to that which takes place in acutely-inflamed serous membranes, when plastic lymph is thrown out, and is about to become organized. In the case of the serous membranes, these numerous and minute extravasations of blood into the closely-applied or adherent lymph appear to be the first stage by which the organization of the false membrane commences.

Illustrative
cases and
experiments.

I shall now proceed to relate some of the cases and experiments which have furnished the opportunities of producing the drawings and models which the Collection possesses for the illustration of this subject. They have been most carefully executed, under my own eye, by excellent artists; and their fidelity may be relied on.

12. 10. 1829. *Guy's Hospital*. No. 1.—Examination of the body of William Robert Squires, æt. 16, admitted into Luke's Ward on the 11th, and who died about twenty-six hours after having swal-

lowed arsenic by accident. It appears that on the morning of the 10th he picked up a piece of cheese, which his master had charged with arsenic, and placed as a poison for rats. Having shaken or blown it, to get rid of the dust or flour which he thought was upon it, he swallowed it. He afterwards took his dinner, and went to his work; but was seized with vomiting and tormina. The cause of his illness was not suspected until the following day, when the lad's master discovered that the poisoned cheese had been removed. He was brought to the hospital, and two 5-grain doses of sulphate of zinc were given. They produced vomiting of bilious matter, mixed with a flake or two of a substance resembling a semitransparent membrane, spotted with blood. A blister was then applied, but he died almost immediately after. His pulse was very quick; but his symptoms, even a short time before death, did not appear very urgent. He had passed stools, and had complained of pain of head, but not of heat of the throat.

Case of poisoning with arsenic.

The appearance of the body indicated an age less than that assigned to the lad. The body was in good condition, but mottled with rather light-coloured irregular livid spots.

Head.—The head was not opened.

Chest.—The viscera of the chest were healthy, but the lungs exhibited considerable cadaveric engorgement. The remains of the thymus gland were large. The heart was rather small and contracted: it contained some coagulated blood.

Abdomen.—There was a generally diffused light rose-colour over the greater part of the exterior of the intestines; but it appeared rather to receive the tinge from congestion than from inflammation, not being attended with any effusion of lymph or other product of inflammation, and not particularly affecting parts in contact; but portions of the whole calibre, at intervals, which generally occurred in depending portions, were of a deeper colour than the rest. The interior of the œsophagus was, to all appearance, healthy, or, at most, of a *very faint* rose-colour. The mucous membrane of the stomach was corrugated; and exhibited extensive deep and bright injection, not nearly so uniformly diffused, as is often the case, but most considerably affecting the rugæ. The middle third was the most considerably affected, but there was no marked difference at that part which is opposed to the cardiac orifice. There was no decided abrasion, but at two or three small points the effused lymph was adherent. The pyloric extremity was the least

reddened, but at this part the follicular glands were elevated and very distinct. The stomach contained a considerable quantity of watery bilious fluid, and a mass which appeared chiefly to consist of a coagulated secretion resembling the plastic lymph on the surface of an inflamed serous membrane. It was about the size of the palm of one's hand, and had very strongly received the impression of the rugæ of the stomach; and the surface in contact with the lining membrane closely resembled it in colour, and in the distribution of the extravasated blood, intimately intermixed with it on this surface. The other surface resembled common coagulable lymph; but entangled in it there was a fragment of what appeared to be partially dissolved cheese, mixed with numerous particles of white opaque matter. A small quantity taken from this part, dried and mixed with black flux and heated, afforded a distinct trace of sublimed metallic arsenic. Another portion, reduced on charcoal before the blowpipe, yielded the alliaceous odour. There was a diffused and light but not bright redness of the duodenum. A similar condition, but in a much less-marked degree, was observable throughout the small intestines, in which the solitary glands were particularly distinct: there was scarcely any fœcal matter in the canal, but there was abundance of secretion, which in its character appeared intermediate between ordinary mucus and coagulable lymph. There was a slight degree of œdema of the submucous cellular membrane. The large intestines were of a more natural appearance. The mucous membrane was generally pale, but there was a manifest increase of redness about the verge of the anus. Many of the mesenteric glands were much enlarged. The structure of the liver appeared to be healthy, with the exception of some scattered ecchymosed spots, obviously of recent formation, and a little dappling of a lighter colour. The gall-bladder was distended with rather dilute bile. The spleen and pancreas were healthy, as were also the kidneys and bladder; excepting some increased vascularity of the mucous membrane of the bladder, near the cervix, at the posterior part.

The points worthy of remark in this case appear to be: 1st, That though a considerable quantity of arsenic had been taken, the symptoms which followed were not proportionably urgent and rapid. For this there appeared to have been at least two causes. The cheese, in which the arsenic was involved, having resisted digestion, seems to have prevented much of the arsenic from coming in contact with the

stomach. The food which was taken almost immediately after the swallowing of the poison may have also acted in a similar manner. It may also have had the effect of exciting the healthy action of the stomach, by setting up the digestive process: this appears to be analogous to what takes place in horses which have eaten the leaves of the yew-tree, which are an active poison to horses and other cattle. They generally die in a few hours after taking this poison; but it has been shewn, by my friend Bracy Clark, that if food be taken in conjunction with, or immediately after, the yew-leaves, the injurious effects do not follow, but the poison and the food appear to be digested together. The second point is the complete illustration of the remarks which I have offered respecting the production of coagulable lymph, and of the escape of blood from minute points on the inflamed surface. 3dly, The detachment of this layer of lymph from the mucous surface, which was probably brought about by the efforts to vomit, renewed with increased energy by the emetics of sulphate of zinc. This is a practical point bearing on the use of emetics, and the mode of employing them.

22. 8. 1834. *Guy's Hospital*. No. 2.—Examination of the body of A. B. aged about 35 years, a patient of B. B. Cooper's, in Accident Ward; admitted on the 21st, a short time after he had taken about an ounce of arsenic. He was a man of dissolute and intemperate habits, and took the arsenic while in a state of intoxication. Vomiting had taken place in about half-an-hour after he had swallowed the poison. On medical assistance being obtained, the stomach-pump was freely employed: he was afterwards removed to the hospital; where an emetic of sulphate of zinc was administered, and acted pretty freely. The patient was then perfectly sensible, and endeavoured, as far as lay in his power, to co-operate with the means employed for his recovery. Besides the emetic, a considerable quantity of chalk was given to him. He was affected with purging as well as vomiting. His first stools were not seen, but those which he afterwards passed contained much jellylike mucus. He passed some urine, the character of which was not noticed. The abdomen was somewhat painful, when pressed.

Case of poisoning with arsenic.

He sunk to a state of collapse about midnight.

The external appearances presented nothing remarkable. The body was in good condition as to flesh, and its surface generally pale.

The head was not opened.

The pleura on the right side was almost universally adherent by a firm old adventitious cellular membrane. The left was perfectly free from adhesions: there was little or no serum in its cavity. The substance of the lungs appeared generally crepitant and healthy; but posteriorly there was a good deal of sanguineous engorgement, having very much the character of pulmonary apoplexy. In the anterior portion of the lung were one or two rounded portions, having completely this character. The pericardium contained some straw-coloured serum. The heart was large, but neither remarkably gorged nor contracted: the right auricle was rather distended: the blood in the right ventricle was partially coagulated with some separation of fibrin. The peritoneum was partially minutely injected, especially towards the cardiac extremity of the stomach, and on some of the convolutions of the small intestines. The branches of the mesenteric veins were somewhat distended. There was a small quantity of straw-coloured serum in the lower pelvis, with some tender diaphanous films of coagulable lymph, which retained the serum in its meshes. (This lymph may have separated from the serum by coagulation after death.) The stomach was flaccid and slightly distended, containing air and dirty turbid chocolate-colour fluid; in which were some gritty matter, and a softer whitish powder, probably chalk. There was no concrete mucus or lymph adherent to the internal surface of the stomach. The mucous membrane was generally of an intense red colour, deepest about the middle towards the smaller curvature, a little less so at the cardia, and considerably less towards the pylorus and greater curvature. The redness was not altogether diffused, but for the most part assumed the character of a dendritic capillary injection. In some instances this redness was most intense where rugæ appeared to have existed. Along the greater curvature, and a little towards the pylorus, the remains of the rugæ were very evident, and of a livid or chocolate colour, the substance of the mucous membrane being considerably thickened along their course. The surface of the membrane generally was slightly granular: there was no appearance of abrasion produced either by the poison or the stomach-pump. The mucous membrane did not appear particularly soft, but was perhaps a little thickened. In the injected parts between the distended dendritic capillaries there was a small appearance of white opacity, suggesting the idea that a little lymph had been separated in the substance of the membrane.

This appearance was less distinct than in some other cases of a similar kind. The duodenum was mottled with red colour, but not by any means intensely injected. Throughout the small intestines there was a marked redness, approaching to lilac, and of a light colour, in the course of the *valvulae conniventes*. The mucus which they contained was rather thick, grumous and turbid, but by no means ropy. The aggregate and solitary glands were not particularly developed. The mucous membrane of the colon, as far as it was examined, was pale, and covered with thick mucus. Towards the rectum, and in that intestine, the mucous membrane was a little injected in spots: this was most considerable towards the anus. The mucous membrane at this part resembled paste, and had very little odour. The mucous glands were developed. The liver was rather large, of a mottled yellow colour, with a granular appearance, having a good deal of the character of liver met with after the abuse of mercury; the acini assuming the form of small rounded bodies: in some spots there were contraction and induration of the intervening substance, and one or two small semi-cartilaginous bodies imbedded in its substance near the surface: they were probably the effect of blows, or some other old local injury. The gall-bladder was distended with greenish bile: no trace of bile had been observed in the alimentary canal. The pancreas was healthy, but perhaps more coloured than is usual. The spleen was of moderate size, and apparently healthy. The kidneys were healthy, but rather injected. The bladder was contracted; and its mucous membrane a little injected, especially towards the cervix, where the veins were distended.

The principal points of consideration which this case suggests, are, 1st, The greater rapidity with which death followed the taking the poison; 2dly, The differences in the appearances observed after death, consisting in the more general diffusion of redness and injection, and in the absence of plastic lymph; 3dly, The different mode of treatment, consisting in the use of the stomach-pump and the liberal use of emetics, to which may be ascribed the removal of the coagulable lymph, had it been thrown out, and the application of arsenic in solution to almost every part of the stomach, instead of partially, in a solid form.

The contents of the stomach and small intestines of this patient were very carefully examined by R. H. Brett, who has devoted great

attention to chemical research. I need not detail the process to which he had recourse. There was no difficulty in the discovery of arsenic in the stomach, from which some remains of the white oxide were taken. The presence of the arsenic in the intestine was made certain, but not without considerable difficulty; and its quantity appeared to be very minute. On this I would lay some stress; as in the experiments which I have next to relate—the one on a dog, the other on a horse—no arsenic could be discovered in the intestines, though carefully sought by equally-practised analysts.

Experiment
on a dog with
arsenic.

No. 3.—The next example of poisoning by arsenic, which I shall relate, is that of a dog. And here I would observe, that I met with considerable difficulty before I succeeded in having a dog killed with this poison: for although dogs do not at first refuse to take either liquid or solid food with which arsenic has been mixed, yet, having taken it, they readily reject it from the stomach, and then appear to grow suspicious, and generally refuse further doses. I at length succeeded, with the assistance of T. Davis, by giving repeated doses, so small as to be disguised, at the intervals of an hour each, to a hungry dog. He retained some of the doses for an hour and a half, or more. He vomited after each. He survived the first dose more than twelve hours; but as he died in the course of the night, when he was not watched, it is impossible to state the exact time. In the stomach of this dog, which was examined the following morning, the mucous membrane was found deeply reddened towards the cardiac extremity, and in other parts; to some of which the arsenic in substance was attached, being intermixed with the secretion, which in some respects resembled coagulable lymph, and assumed the form of a false membrane. When this layer was fresh raised from the surface of the membrane, the inflamed and reddened texture was of a bright colour. When the secretion had been previously separated, the membrane, coloured by injection or extravasation, presented a deeper hue. The viscid as well as more solid exudation from the surface of the stomach was somewhat tinged with blood, some of the particles of which were examined by my friend J. J. Lister: they had not wholly lost their form, but the regularity of their outline was considerably impaired.

Though this blood had doubtless escaped from some portion of abraded surface, I did not discover any spot in which abrasion had

taken place. Almost every part on the intestinal canal of this dog exhibited more or less injection of a bright colour. In the higher portions, the redness occupied nearly the whole surface, but lower down it strikingly marked the summits of the rugæ. The mucous glands towards the termination of the rectum were considerably enlarged. The contents of the intestinal canal were examined by G. O. Rees; but no trace of arsenic could be detected, even in the small intestines.

No. 4.—This illustration I take from the case of a horse which received $2\frac{1}{2}$ ounces of arsenic rolled up in dry paper. In four hours the effect of the poison was strongly shewn; and in the evening, ten hours from the time at which it was given, the animal died. The stomach was examined the following morning. It was distended with masticated hay, mixed with a moderate quantity of fluid. A considerable quantity of the arsenic in substance was found about the greater curvature, rather more than one-third from the pylorus, and consequently applied to the second and third portions of the mucous membrane. Traces of the arsenic were evident in many other parts of the stomach, although it was not collected in substance as at the spot just mentioned. The greater portion of the mucous surface of the middle third was covered with a tenacious layer of secretion, intermediate between lymph and mucus. It was nearly white where applied to the stomach, but the other surface was discoloured as well as roughened by the intermixed and adherent particles of food. The mucous membrane beneath this layer was deeply coloured with blood in those parts with which the arsenic appeared to have been in contact; whilst over a large surface, in which this was not the case, the membrane, though not white, did not seem to be morbidly coloured. The summits of the rugæ and other prominent portions of the mucous surface, both in the third portion of the stomach and in the pylorus, were especially reddened. This was the case with the orifices of the biliary and pancreatic ducts. That portion of the stomach which is covered with a strong cuticular lining did not appear to be at all affected. Most of the bots, of which there were several in this stomach, were still alive. There was some redness in the course of the alimentary canal; but it was neither intense, nor otherwise remarkable. The contents of the intestines were very carefully examined, but no arsenic was discovered.

Experiment
on a horse
with arsenic.

Experiment
on a horse
with arsenic.

No. 5.—A second horse received a portion of arsenic in the same manner as the preceding; except that, instead of being allowed to die, he was killed in four hours, before he had betrayed any symptom of derangement from the dose which he had taken. The stomach was soon after examined. It contained about the same quantity of food as in the former case, and the arsenic in substance was found collected in precisely the same part of the stomach. A considerable portion, however, had also passed the pylorus. The appearances observed in this case were very similar to those observed in the preceding instance, but they were much less intense. The same kind of tenacious layer covered the greater part of the middle portion of the organ. Its free surface was discoloured with intermixed and attached particles of food, but the thickness of this layer was much less than in the former case. The membrane beneath it was but slightly discoloured, except where immediately in contact with the arsenic. That portion of the poison which had passed into the duodenum was implicated in a mass of coagulated lymph, pretty firmly adherent to the surface of the membrane: on raising it, the under surface presented numerous bright red bloody points, and a similar appearance was seen on the membrane from which it had been detached. Lower down in the intestinal canal I did not discover any thing remarkable. I must not omit to observe, that in the stomach of the horse, when no poison has been taken, the viscid adherent mucous secretion is liable to be discoloured on its free surface by adherent particles of food; but a little careful attention will distinguish this layer from the more membranous character of that produced when arsenic has been given.

Experiment
on a horse
with corrosive
sublimate.

The 6th Example which I shall bring forward is that of a horse poisoned with corrosive sublimate, which was given in solution in gruel. The symptoms in this case were at least as urgent as in the first case of poisoning with arsenic. I have already remarked some of the peculiarities distinguishing this form of poisoning from that in which a solid irritant is applied to the mucous membrane.

Experiment
on a dog
with oxalic
acid.

The 7th case is of a very different character from the six preceding, and appears to me to be worthy of particular attention. A pretty strong solution of oxalic acid, containing, I believe, rather more than a dram of the crystallized acid, was injected into the stomach of a dog,

as in the case of the boiling water. The effect was immediate, and death took place in about a quarter of an hour, with symptoms which I did not witness, and cannot now relate. Death in this case was more speedy than I had anticipated; and I was consequently not prepared to examine the body for rather more than twelve hours after it had taken place. At the opening of the abdomen, I was struck with the dryness of the peritoneum, and the general paleness of the contained viscera. This was particularly the case with the intestinal canal. The fat of the epiploon, and other parts within the abdomen, was also remarkably firm and white. The cardiac extremity of the stomach was flaccid, and exhibited a dingy colour, even on its peritoneal surface. Internally, the mucous membrane appeared partially removed, as if by solution, at and near this part. This, and some other parts which were coloured, were of a brown or slate colour: the other parts of the stomach were pale, and partially translucent. I have already noticed the small opaque white scattered points which I have been induced to regard as follicles. Towards the pylorus, the mucus on the surface of the membrane was more abundant and opaque: the intestinal canal was not only of a whitish colour, as I have before stated, but the intestines were unusually firm, as if filled with a pretty stiff pultaceous substance. On opening it, the coats appeared greatly thickened; but, on examination, this appearance was found to be produced by a thick opaque white secretion deposited on the mucous surface, and bearing some similarity to a very thick white fur on the dorsum of a tongue. When this was removed, the pale and almost unchanged villous membrane was distinctly visible. The membrane was perhaps a little softened. When the secretion just mentioned was not of an opaque whitish colour, it was of a dusky brown, of no great intensity. This colour was distinctly situated on the edges of the *valvulæ conniventes*, and was in all probability produced by the action of the acid on the colouring matter of the blood with which the edges of the *valvulæ conniventes* had been injected.

Not only the peculiar appearance which I have just described extended to all or to the greater part of the intestinal canal, but strong acid properties were manifested in it. The rapid diffusion of this noxious agent through so large a portion of the alimentary canal forms a striking contrast with those cases in which arsenic was the poison employed; in which, as it has already been stated, either no trace of

Remarks on
the effects of
acids.

the poison, or such only as were extremely faint, could be detected at more than a short distance beyond the pylorus, although the animal survived the administration of the poison for some hours. It would seem that this extent of the diffusion of the noxious agent is commonly the case with acid poisons, and may be regarded as characteristic *.

The blood in the mesenteric veins was of a dark colour, confirming the observations of Dr. A. T. Thompson, and Dr. Perry of Lausanne. It also appeared to possess acid properties. In observing the effect of oxalic acid on the stomach of the dog, as seen in this case, one can scarcely fail to be struck with the strong resemblance which it bears to the state of the human stomach, as often seen in post-mortem examinations, more especially with respect to the coloured and softened texture of the mucous membrane. The peculiarities in both of these respects have been strongly insisted upon as indicative of chronic inflammation. They unquestionably may be met with when this state has existed; but, if I am not greatly mistaken, they also occur when this has not been the case; and they may with much more probability be referred to the action of the juices of the stomach, which vary greatly in their properties; and doubtless act not only after death, but even in some degree before life is quite extinct.

Experiment
on a dog
with ardent
spirit.

No. 8.—The last case which I have to bring forward is that of poisoning by spirits of wine. In investigating the action of poisons, it was next to impossible to lose sight of an agent, which not only involves many in inextricable misery, but hurries thousands to their graves.

Rather more than an ounce of strong spirit was injected into the stomach of a dog, as in the case of the experiment with boiling water. The effect was immediate. In a minute and a half he vomited mucus, and a little blood; in three minutes he was wandering, and falling in different directions; in five, he fell down, and voided a quantity of urine; the muscles of the abdomen and extremities were thrown into violent action; in thirty-eight minutes he appeared to be dead; but he after-

* The mention of this fact to the Medical Section at the Meeting in Edinburgh gave occasion to my friend Dr. William Thomson to shew me a striking illustration of this principle, in a representation of the effect of poisoning by nitric acid, preserved in the splendid and extensive Collection of Pathological Drawings in the possession of his father Dr. J. Thomson, Professor of Pathology.

wards vomited a thick slimy fluid smelling strongly of alcohol, and died in forty-two minutes. Circumstances prevented the examination from taking place till the following day, when the stomach presented an appearance which is well represented by C. J. Canton. The mucous membrane of the stomach offered strongly-marked and irregular rugæ, in the intervals between which the mucous membrane had a corrugated appearance. It was universally of a reddish-brown colour; which, however, was not equally intense throughout.—Since making this experiment, I have learnt that strikingly similar effects were produced by the exhibition of strong spirit in an experiment performed by my friend and colleague Dr. Roupell, the result of which he has shewn in the second of his splendid Fasciculi. The brighter colour produced in Dr. Roupell's experiment is probably a more genuine effect of alcohol than the browner colour which I obtained, and which may have been in part occasioned by some cadaveric change. There can be little doubt that the extreme effect of ardent spirit in these cases, in which it acted as one of the most prompt of the acrid poisons, is only an exaggeration of that diffused and pernicious irritation of the mucous membrane of the stomach which spirit-drinkers are constantly keeping up or renewing.

The accidental lesions of the stomach having a mechanical rather than a chemical origin, may be produced in either of two modes. The injury may be inflicted from within, by bodies which have passed into the stomach; or violence may be received from without, and wounds inflicted through the parietes.

In the East, where swallowing swords is not an unfrequent exhibition, mischief produced in the former mode may reasonably be supposed to fall in the way of the pathologist; but in Europe such injuries are not likely to be seen, except as the result of rare and remarkable accident: for although careless and rapid eaters are constantly exposing themselves to the risk of swallowing substances which, from their form and texture, might be supposed likely to wound the tender mucous membrane, it would seem that nature has specially provided against the occurrence of

Mechanical
injuries of
two kinds:

1st kind in-
flicted from
within.

such accidents. The experiments of Spalanzani are most remarkable, in connection with this subject. He caused sharp instruments, and even a combination of lancets, to be swallowed by birds; and in few, if any instances, were they found, on examination, to have made incisions. The comparative impunity with which the Indian jugglers, before alluded to, perform their feats—and the still more remarkable and foolish acts which have been committed in this country, in swallowing knives, and other articles calculated to do injury, without the stomach having been perforated by them—seem to indicate, that, even in the human stomach, the contractions of the organ are, in such cases, performed in a manner which evades violence from the resistance of the foreign body. The sympathy, or consent of action, in the contractile fibrous coat, which is seen in these instances, is probably allied to that which we shall have to notice in the intestines. Notwithstanding this provision, the stomach does not always escape unhurt: and surgical writers have recorded cases in which knives, or other sharp instruments which had been swallowed, have completely perforated the stomach, and escaped through the parietes; and it is said that the event has not always been fatal. In the case of the knife-eater to which I have already alluded, the stomach, though not perforated, is much thickened, and its internal surface rough, and permanently discoloured. The only recent injury, mechanically inflicted, which I have seen in the mucous membrane of the stomach has been the consequence of the use of the stomach-pump. This instrument was employed to withdraw a deleterious fluid from the stomach of a man in a state of stupor. The efforts to afford relief were ineffectual; and after the patient's death, a few small ecchymoid spots were discovered on the internal surface of the stomach. They so completely corresponded to the end of the tube, as to leave no doubt of their origin. There was no reason to suppose that they were in the least degree connected with the patient's death; yet, as they were

an evidence that some degree of injury had been inflicted, and that the operation of the pump had been interfered with by the closure of the tube, they demonstrated the superiority of the lateral openings which are now generally made.

The subject of wounds of the stomach, inflicted through the parietes of the abdomen, belong so completely to lectures on surgery, that I need say but little respecting them. These injuries may be of two kinds, as respects their pathological character. They may be either incised, or more or less contused or lacerated. The important sympathies of the stomach, and the extreme danger of fatal peritonitis from the escape of the contents of the organ, concur to render these wounds of the most dangerous description: nevertheless, cases are recorded, which prove that recovery may take place after wounds of both kinds. When the stomach of a recently-killed animal is penetrated by incision, the action of the middle or contractile fibrous coat tends to evert the edges of the wound, and produce prominent lips of mucous membrane. Hence, though the contraction of the middle coat prevents the copious escape of the contents of the stomach, it not merely permits the escape of a little mucus and other fluid, but brings into mutual apposition two mucous surfaces indisposed to union with each other and with the wounded part of the parietes; although, by virtue of a provision which I shall have more particularly to notice when speaking of wounded intestines, they may be brought into apposition with it also. This consideration leads me to conjecture, that it might be advantageous to allow the instrument, by which the injury was inflicted, to remain in the wound; as it would probably be embraced, without eversion, by the lips of the incision through the stomach, which would likewise be kept in constant apposition to the wound in the parietes. The curative process would then almost solely depend on partial adhesive inflammation of the serous membrane; which is precisely that

2d kind inflicted through the parietes of the abdomen.

which nature employs in cases of perforation of the stomach, by ulceration from within.

When the wound of the stomach is of the contused character, as in the case of gun-shot injury, although the lesion of structure is likely to be much more severe, the circumstances adverted to in relation to incised wounds are less likely to exist. The action of the middle coat of the stomach, and also that of the muscles of the abdomen, at the wounded part, are likely to be entirely suspended: hence constant apposition, without eversion of the mucous surface. It is further probable, that there may really be no absolute aperture until a portion of the injured structures are detached by sloughing; and before this sloughing can take place, peritoneal adhesions would be likely to have formed, so as to obviate an important part of the danger.

Case of A.
St. Martin.

Perhaps the most remarkable instance of survival, after very severe injury of the character which we are now considering, is that of Alexis St. Martin. This young man, a French Canadian, 18 years of age, was accidentally wounded by the discharge of a musket loaded with duck-shot, when about a yard from the muzzle. The contents entered his left side in an oblique direction, fracturing and carrying away the anterior half of the sixth rib, fracturing the fifth, lacerating the lower portion of the left lobe of the lungs, the diaphragm, and perforating the stomach. The charge, with fragments of clothing and pieces of fractured ribs, was driven into the muscles and cavity of the chest.

After cleansing the wound, and replacing the stomach and lungs as far as practicable, dressings were applied. In a few days the injured parts sloughed and came away, leaving a perforation into the stomach plainly to be seen. For seventeen days, all that entered the stomach through the œsophagus passed out through the wound; and the only means of sustaining him was by nutritious injections, until compresses and bandages could be applied, so as to retain his food. In the fifth week, cicatrization and contraction of the

wound commenced, but it shewed no disposition to close its orifice: whenever it was dressed, the contents of the stomach would flow out, in proportion to the quantity recently taken. After trying every means, for many months, to close the orifice, without success, it was given up as impracticable; except by incising and bringing the lips together by means of sutures; an operation to which the patient would not submit.

In twelve months from the time of the accident, the injured parts were all sound; excepting the aperture in the stomach and side, which was about two-and-a-half inches in circumference, two inches below the left nipple. St. Martin now rapidly improved in health and strength; and in about six months afterwards, a small fold, or doubling of the coats of the stomach, appeared, forming at the superior margin of the orifice, slightly protruding, and increasing till it filled the aperture, so as to supersede the necessity of the compress and bandage for retaining the contents of the stomach. This valvular formation adapted itself to the orifice, so as completely to prevent the efflux of the gastric contents when the stomach was full, but was easily depressed with the finger. From this time he became, and continued, active, healthy, and vigorous; though constantly subjected to a series of experiments on the interior of the stomach, allowing to be introduced, or taken out, at the aperture, different kinds of food, drinks, elastic catheters, thermometer-tubes, gastric-juice, chyme, &c., almost daily, and sometimes hourly. The mode of extracting the gastric-juice was by placing the subject on his right side, depressing the valve within the aperture, introducing a gum-elastic tube of the size of a large quill five or six inches into the stomach, and then turning him on the left side until the orifice became dependent. In health, and when free from food, the stomach was usually entirely empty, and contracted upon itself. On introducing the tube, the fluid soon began to flow, first by drops, and then in a short continuous stream. Moving the

tube about increased the discharge: the quantity obtained varied from four drachms to two ounces, according to the condition of the stomach. Its extraction was generally attended by that sensation at the pit of the stomach termed sinking, with slight faintness, which made it necessary to stop the operation. The usual time of extracting the juice was early in the morning, when the stomach was empty and clean.

On laying him horizontally on his back, pressing upon the hepatic region, agitating a little, and turning him to the left side, bright yellow bile appeared to flow freely through the pylorus, and passed out through the tube: sometimes it was found mixed with gastric-juice without this operation, but not often, unless excited by some other cause. The chymous fluids were easily taken out, by depressing the valve, shaking a little, and pressing upwards. In this manner any quantity necessary for experiment could be obtained. On pressing down the valve when the stomach was full, the contents would flow out copiously: when nearly empty and quiescent, the interior of the cavity could be examined, to the depth of five or six inches, if kept distended by artificial means; and the food and drink could be seen entering it through the ring of the œsophagus, if swallowed at this time.*

* For further particulars respecting this case, I must refer you to the work of Dr. Beaumont, an American physician, in the military service of the United States. The interesting experiments which he has detailed have already been quoted in various publications.

LECTURE XX.

ON THE MUCOUS MEMBRANES.

THE FIRST PORTION OF THE SMALL INTESTINES, AND THE BILIARY AND PANCREATIC DUCTS.

FIRST PART OF THE SMALL INTESTINES—PECULIARITIES OF THE DUODENUM—SUBDIVISION OF THE DUODENUM—DEFICIENT—REMARKABLY LACERABLE—EXCESS—DOUBLE—DILATED—VARIETIES IN COLOUR—DIFFICULTY OF DETECTING DISEASE OF THIS PART—PYLORIVALVULAR PORTION—ITS CHARACTERS—GLANDULAR APPENDAGES—NECESSITY FOR THEIR ABUNDANCE—PRONENESS TO DISEASE—STOMACH AND DUODENUM NOT ALWAYS SIMULTANEOUSLY AFFECTED—INFLAMMATION—PRETERNATURALLY THICKENED AND FIRM—DISCOLOURED—ULCERATED—IN CONJUNCTION WITH TUBERCULAR DEPOSIT—WITH MALIGNANT DISEASE—WORMS—BRUNNER'S GLANDS—ACCIDENTAL INJURY—MIDDLE PORTION OF THE DUODENUM—CHARACTERS—VALVULÆ CONNIVENTES—INFLAMMATION—BROUSSAIS' VIEWS OF DUODENITIS—JAUNDICE—DR. STROUD'S OPINION—BILIARY DUCTS—CHARACTER—DEFICIENCY—GENERAL—PARTIAL—ACQUIRED—EXCESS—DILATATION—ELONGATION—INFLAMMATION—CONTRACTION AND OB-LITERATION—EMPHYSEMA OF THE SUBMUCOUS CELLULAR MEMBRANE—SUPPOSED SPASM—GALL-BLADDER—PECULIARITIES OF ITS MUCOUS MEMBRANE—SECRE-TION—DEFICIENT GALL-BLADDER—PRETERNATURALLY SMALL—LARGE—ACUTE INFLAMMATION—ULCERATION—PERFORATION BY GALL-STONES—ABCESSES—SOFTENED TUBERCLES AND MALIGNANT TUMOURS—MALIGNANT DISEASE OF THE MUCOUS MEMBRANE—OF THE SUBMUCOUS CELLULAR MEMBRANE—CEDEMA OF THE SUBMUCOUS CELLULAR MEMBRANE—SPHACELATED—CONTRACTILE FIBROUS COAT—INDISTINCT—HYPERTROPHIED—CONTRACTED—WOUNDS OF GALL-BLAD-DER—DUCT OF THE PANCREAS—ITS CHARACTER—CONTRACTED—DILATED—CYSTS LIKE RANULA—LAST PORTION OF THE DUODENUM—JEJUNUM—CHARACTER—VARIETY IN SIZE—IN COLOUR—LACTEAL VESSELS IN THE VILLI FILLED WITH CHYLE—VALVULÆ CONNIVENTES—SECRETION INCREASED—ALTERED—PRETER-NATURAL DISTENSION—INFLAMMATORY AND CONGESTIVE INJECTION—ULCERA-TION—CEDEMA AND EFFUSION OF BLOOD IN SUBMUCOUS CELLULAR MEMBRANE—SMALL DEFINED COLLECTIONS OF CHYLE—HERNIA OF THE JEJUNUM—RUPTURE FROM EXTERNAL INJURY—GENERAL REMARKS APPLICABLE TO THE MIDDLE PORTION OF THE SMALL INTESTINE—SHORTENING, AS A CONSEQUENCE OF PERI-TONITIS—GENERAL EMACIATION OF ALL THE COATS—PARTIAL CONTRACTION—DI-LATATION—THICKENING—POUCHES—INTUSSUCEPTION—TWO FORMS—1ST FORM—CASE—2D FORM—PROBABLY TAKES PLACE IN ARTICULO MORTIS—OPINION OF DR. MONRO QUESTIONED—SLOUGHING OF A PORTION OF THE INTESTINE FROM INVAGINATION—ALTERED SECRETION—REMARKABLY AQUEOUS—RESEMBLING RICE-WATER—REMARK ON THE ABSENCE OF DIARRHŒA—SECRETION RESEM-

BLING PASTE — SANGUINOLENT — RESEMBLING MILK — APPEARANCES OF THE MEMBRANE PRODUCED BY INFLAMMATION—REMARK RESPECTING REDNESS AND INJECTION—BILLARD'S DISTINCTIONS—COMMENTS UPON THEM—AS RESPECTS SOFTENING, SITUATION OF INJECTION, DISTENDED VEINS, THICKENED MEMBRANE, STATE OF SECRETION—OF PARTIAL DIFFUSED REDNESS—PARTIAL REDNESS INFLUENCED BY GLANDS—ULCERATION OF THE MUCOUS MEMBRANE.

GENTLEMEN—

First part of
small intes-
tines.

HAVING devoted several of my last Lectures to the consideration of the morbid appearances of the stomach, I shall to-day solicit your attention to the first portion of the small intestines, the Duodenum. Even this small portion will require to be again subdivided.

Peculiarities
of the duo-
denum.

The first twelve inches of the small intestine, to which the name of duodenum has been given, has long been supposed to possess a character of its own, distinguishing it from the remaining portion of the small intestine. It has sometimes been called the subsidiary stomach; in consequence, no doubt, of its being supposed that a considerable part of the process of digestion left unperformed by the stomach is carried on in this portion of the intestine. This idea was probably suggested by the fact, that it is here that the food receives the addition of those important fluids, the bile, and pancreatic juice. It is also furnished with secretions from glands of its own, which arrested the attention of Brunner; —of which I shall have to speak more particularly hereafter. It is also sometimes found so much enlarged in its diameter, as to seem, from this cause, to merit the name of subsidiary stomach. The duodenum has other peculiarities besides those on which its character of a subsidiary stomach may be supposed to depend. It is much more restrained from motion than the rest of the small intestines; and instead of having a mesentery, it is through a considerable part of its extent only imperfectly surrounded by peritoneum, by which it is firmly attached to the spine; but at each extremity it is not only perfectly covered by peritoneum, but allowed a limited extent of motion, by which it is accommodated to the movements of the pylorus occa-

sioned by the different states of distension and contraction of the stomach, and to the movements of the remaining portions of the small intestine to which a more considerable latitude is given by the breadth of the mesentery. The duodenum, in its comparatively short course, takes several different directions, so that it may be decidedly regarded as a crooked intestine. It has been by anatomists described in three portions, of which the distinction is founded on the difference of direction. I am also disposed to divide this intestine into three portions; but upon a very different principle, namely, that of structure and difference of function: the first being that to which Billard gave the name of pylorivalvular space; the second, that into which the biliary and pancreatic ducts empty themselves; and the third, that in which the intestine assumes the character of the greater part of the remaining portion of small intestine, although distinguished from it externally by the want of an equal degree of freedom of motion.

Subdivision
of the duo-
denum.

Before I proceed to speak of these portions of the duodenum separately, I shall make a few remarks applicable to the intestine generally.—The total deficiency of the duodenum is sometimes met with in very imperfect acephalous foetuses; in which, though a portion of alimentary canal has, I believe, been invariably found, it has always appeared to consist of the lower extremity of the small and commencement of the large intestine, or perhaps, in a very few instances, of the latter only. I do not know of any instance of the duodenum, when present, being preternaturally small and contracted*.

Deficient.

I have occasionally found its substance so extremely attenuated, that it could be readily torn through. I suspect that this extreme lacerability must have been confined to that portion of the duodenum which is only imperfectly

Remarkably
lacerable.

* Dr. Abercrombie found in a man fifty years of age the duodenum three inches from the stomach, for the extent of an inch, thick, hard, and contracted, so as only to admit the passage of a director.

covered by peritoneum. I regret that I omitted to notice this point, when the opportunities for observation occurred to me.

The duodenum has been seen of a pulpy softness, in conjunction with a similar state of the stomach.

Excess.
Double. The duodenum has been known to present a deviation consisting of excess, in which this portion of the alimentary canal was double.—I state this anomaly on the authority of Meckel.—It is difficult to conceive its occurrence, except in those monstrous fœtuses in which the upper half of the body is double, and the lower single, or *vice versâ*.

Dilated. The duodenum, as I have already observed, is sometimes found dilated, so as, on this account, almost to merit the appellation of a second stomach: yet I think this deviation from its ordinary state is decidedly rare; and I cannot call to mind any instance in which this portion of the canal has nearly equalled the size to which the inferior portion of the small intestine is apt to be dilated in cases of stricture of the colon: in fact, it is very uncommon to find the duodenum containing any thing but mucus, and, more or less, bilious fluid.

Varieties in colour.

The colour of the duodenum, like that of the stomach, has been variously and unsatisfactorily described by most of those who preceded Billard, and from the same cause;—cadaveric discolourations, and the influence of the activity of the digestive progress, not having been sufficiently attended to. According to the observations of Billard, the correctness of which I have no hesitation in confirming, there is often a well-marked transition of colour at the junction of the pylorus with the duodenum; that of the stomach being generally of a deader white than the internal surface of the duodenum, which is more often of an ash colour. I believe that this may, in part at least, be attributed to the difference between the texture of the mucous membrane of the duodenum and that of the stomach. The former is denser and more compact; and probably, on this account,

longer retains any occasional discolouration which it may receive. During the process of digestion, the duodenum, like the stomach, acquires a light rose-coloured diffused blush. It may also be similarly or more intensely coloured from irritation arising from other causes; when, if the colouring matter of the blood should happen to be detained so as to occasion a kind of stasis, it would acquire a dark colour, and occasion different shades of grey in the membrane in question. It sometimes exists to an intensity which may well be regarded as the result of a morbid condition either existing at the time of death or previously. This kind of discolouration, existing to a very slight degree, may have occasioned the ash-coloured hue which Billard has noticed.

Although the derangements of the duodenum have been treated of by some pathologists as constituting a very distinct class of cases, assuming more or less the character of chronic dyspepsia, I must confess my strong doubt as to our being acquainted, at present, with the pathognomonic symptoms connected with duodenal derangement, with any thing like sufficient precision to enable us to remove the obscurity which the deep-seated situation of the organ affected could not fail to occasion. In noticing the different parts of the duodenum separately, I shall endeavour to mention some of the symptoms observed in conjunction with them; but I am far from designing to point them out as evidences of derangement of the duodenum.

Difficulty in distinctly detecting disease of this part.

OF THE PYLORIVALVULAR PORTION OF THE DUODENUM.

This portion of the duodenum has been noticed, and the necessity for its distinction from the other parts of this intestine pointed out, by Billard. It occupies about an inch and a half, or rather more, between the pylorus and the commencement of the valvulæ conniventes. The absence of these folds of the mucous membrane forms so striking a contrast with the appearance presented by other parts of the

Characters.

small intestine, that it is truly wonderful that the fact has been so much neglected. I have observed several instances of elaborately-executed drawings and prints in which the *valvulae conniventes* have been continued up to the pylorus.

Glandular
appendages.

The pylorivalvular portion of the duodenum is one of those parts of the alimentary canal which, like the fauces and the cardia, are specially supplied with glandular apparatus: in fact, its whole surface seems to be studded with closely-placed, though still solitary or distinct glandular bodies. It was in this situation that the solitary glands first claimed the attention of Brunner, whose name they have ever since continued to bear. They are not only more numerous, but generally more distinct in this than the succeeding portions of the small intestine; and are not unfrequently found of a size, either from disease or natural conformation, which gives to the pylorivalvular portion a decidedly granular surface, which might sometimes almost be compared to the base of the tongue covered with its large *papillae*: at the same time, I would not be understood as suggesting a further similarity of structure between these two parts.

Necessity
for their
abundance.

It may not be amiss to inquire, whether there is any obvious reason for this portion of the duodenum being thus deficient in *valvulae conniventes*, and at the same time superiorly furnished with mucous glands, as well as possessed of a somewhat thicker and closer texture. The reason I conceive to be, that this portion of the duodenum receives the chyme of various consistence, propelled with different degrees of force, and possessing a great variety of properties; which if brought at once into immediate contact with the mucous membrane of the duodenum, would be very likely to irritate and injure it. Squeezed through the small opening of the pylorus, the mass of half-digested food can hardly be supposed to be involved in a covering of mucus from the stomach; and, as it passes onwards, it probably carries along with it much of that produced by the duodenum; which would suffer from this privation, were it not, at the part

which we are now considering, very liberally supplied with the means of meeting the demand. The absence of the *valvulæ conniventes* may be as satisfactorily accounted for as the presence of the muciparous glands. On the one hand, they would interfere with the progress of the chyme, which needs no delay in this part; and, on the other, the admixture of the bile and pancreatic fluid not having been made, no provision is required for the absorption of chyle.

Notwithstanding the ample provision which is made for the protection of the pylorivalvular space in its extensive muciparous apparatus, it would seem to be more liable to derangement than many other parts of the small intestine. In this respect it agrees with other parts which are furnished with apparatus for a larger supply of secretion than is allotted to other parts; as, for example, the fauces, which exhibit, in the most striking manner, both the liability of disease and the provision for the supply of secretion. The peculiarity of these parts, in the respect which I am now considering, appears to depend upon a twofold cause: 1st, They are more exposed to injury, which calls for the greater exertion to meet it: and 2dly, This activity of function, when deranged, exhibits its power, in the acuteness and energy with which it carries on the deranged or pathological process. Although the pylorivalvular space is free from *valvulæ conniventes*, or folds, having a direction nearly at right-angles to the axis of the intestine, it is sometimes observed to have *plicæ* in the opposite direction, which appear to afford the means of dilatation which the comparatively unyielding nature of the mucous membrane of the part would not so readily admit of as in the case of the stomach. We may therefore sometimes find these *plicæ*, and sometimes not; and it does not appear that much importance need be attached to them: in fact, in these, and other *plicæ* of the mucous membrane of the alimentary canal, very considerable differences may be noticed; which appear to depend either on original conformation, producing a great extent of mucous

Proneness
to disease.

Plicæ.

Stomach and
duodenum
not always
similarly af-
fected.

membrane, or the accidental contraction of the middle coat, throwing the mucous membrane, although of moderate dimensions, into considerable rugæ. This part of the duodenum, although so immediately connected with the stomach, does not necessarily participate with the stomach in its increase of vascularity, whether produced by irritation or congestion; since we may sometimes find that of the stomach is considerably reddened, whilst the duodenum, even at its commencement, is tolerably pale; and, on the other hand, the duodenum and subsequent parts of the intestinal canal may be injected whilst the stomach remains nearly or quite pale. Even the natural blush excited in the duodenum is probably not simultaneous with that produced by the same cause in the stomach: they are, however not unfrequently similarly circumstanced with respect to vascular injection.

Inflamma-
tion.

I am not aware of any instance either of the effusion of highly-plastic lymph, of thick viscid mucus, or of a puriform secretion, being found in this or any other part of the duodenum; but we may sometimes find curdly shreds, apparently consisting of coagulable lymph intermixed with the variously-coloured watery mucus liable to be found in the duodenum, without our being able to say whether it has been derived from this intestine itself, or whether it has proceeded from the stomach, the pancreas, or some inferior portion of the canal. The evidence of inflammation must therefore be sought in the membrane itself: it may be inferred from a high degree of vascularity principally affecting the summits of rugæ and other elevations, and may be best distinguished from the congested state most liable to be confounded with it, by reference to the state of the veins leading from the part, and by consideration of the circumstances under which death took place, as well as by the examination of other parts most likely to have participated in the congestion that had been the cause of discolouration. The duodenum is sometimes found preternaturally thickened, of a firm texture, and of a granular surface from the promi-

Preternatu-
rally thick-
ened, firm,

nence of the numerous glands of Brunner. I conceive that this state must be the result of a continued irritation of an inflammatory character, although at the time of death the parts so circumstanced may be quite pale. Various shades of grey or slate colour, which are sometimes found in the pylorivalvular space as well as in other parts of the duodenum, may also be regarded as indications of pre-existing injection, which may have been of an inflammatory character. discoloured,

More unequivocal evidence of inflammation is sometimes found in the form of ulceration; to which this part is more prone, from a variety of causes, than any other part of the small intestine, until we approach towards the termination of the ileum. The ulcers which I have repeatedly, although not very frequently, observed in the pylorivalvular space, as essentially belonging to the mucous membrane, have been well defined, of a more or less circular figure, with edges pretty cleanly cut through, somewhat thickened, and surrounded by increased vascularity; the subjacent structure being even, and more or less indurated. In some instances, the ulceration is so deep as nearly or quite to produce perforation. When it does so, the opening in the mucous membrane is greater than that in the subjacent coat, and the external opening quite small. ulcerated,

Ulceration of the duodenum, such as I have just described, has occurred in cases where there has been obstinate vomiting; and I believe this to have been generally the case, although I am not prepared to assert that it is so. I believe that in some instances the vomiting has been the cause of the ulceration, as much as the ulceration has been the means of keeping up the vomiting. One well-marked case of ulceration, of the kind to which I am now referring, occurred in a young woman whose vomiting commenced on her becoming pregnant, and continued uncontrolled till about the fourth month, when she died. The vomiting in this case was evidently secondary, and not the result of original disease of the alimentary canal; in which the ulceration

alluded to was the principal morbid appearance, and even this did not appear to have been of long standing. The emaciation of the patient in all probability concurred with the irritation of vomiting to produce a disposition to ulceration.

In another case, in which this ulceration was deeper and broader, and evidently of longer standing, the patient was also affected with a stricture of the pylorus not of a malignant character.

in conjunction with tubercular deposit,

Ulceration of this part of the duodenum may be occasioned by the softening of tuberculous matter beneath the lining membrane. In one example of this kind which I have met with, as in most cases of tubercular ulceration of the small intestines, the ulcers were most numerous towards the termination of the ileum; whence it is not easy to determine how much of the patient's symptoms were referable to the state of the duodenum.

with malignant disease.

The most remarkable instances of ulceration of the duodenum, but which have not been strictly confined to the pylorivalvular space, have been occasioned by the softening of malignant tubercles situated either in the liver or about the absorbent glands near the porta and pancreas. Such ulcers, commencing externally to the intestine, are necessarily deep; and, in the instances which I have met with, the peculiar elevated edge which produces so characteristic an appearance, when the mucous membrane itself is the subject of malignant disease, was wholly wanting.

Worms.

Intestinal worms have been found in this part of the intestine, and making their way through the pylorus, which they tightly plugged up. The patient, in whom this state of things existed, was carried off by sudden death; for which my friend Dr. Foville, to whom the case occurred, discovered no other cause.

Brunner's Glands.

The muciparous glands of the pylorivalvular space (those of Brunner) are often met with in a state of considerable developement; which, in some instances, may not be the

result of disease: but I apprehend it must be regarded as morbid, when, in conjunction with a strikingly granular surface, the substance of the intestine presents a thickened and condensed structure, to which I have already alluded.

I know no instances of wounds in this part of the intestine;—the only instances of lesion not produced by disease being those occasioned by poisons, the effect of which may be seen in this part, in common with other portions of the alimentary canal.*

Accidental injury.

The next or middle portion of the duodenum is rendered remarkable by the commencement of the valvulæ conniventes, by the opening of the biliary and pancreatic ducts, and by its more completely fixed position. The valvulæ conniventes, according to Billard, are more closely placed in this part of the intestine than either in the jejunum or the ileum, considerably overlapping each other, producing the character which botanists call imbricated. By this means the extent of lining membrane is greatly increased, and the absorption of chyle, which is most abundant in this part, is also promoted.

Middle portion of the duodenum.

Characters.

It has been stated by a French anatomist, that the opening of the ducts is always observable in this part of the duodenum; but Billard asserts that sometimes the opening can only be discovered by causing bile or some other substance to pass from the duct into the intestine. I quite unite with Billard in the occasional difficulty of finding the visible opening of the ducts in the healthy state of the parts. In the horse, and probably in some other animals, the opening of the ducts produces a decided prominence: the same thing may sometimes occur in man, and may even exist to a degree which makes it remarkable as a morbid appearance;—but of this hereafter.

The villi, the existence of which I have called in question

* The duodenum has been found ruptured; but it was supposed that some previous softening had taken place. The accident was preceded by a considerable effort made by the patient.

on the mucous membrane of the stomach, begin to be evident immediately that we have passed the pylorus; but they are particularly well marked in the portion of the duodenum which we are now considering. The muciparous glands, which are of the solitary or distinct kind, are much less numerous and apparent than in the pylorivalvular space, but perhaps more so than in the remaining portion of the small intestine, until we approach to the termination of the ileum. The secretion and contents of this part of the duodenum are very similar to those which I have mentioned in speaking of the pylorivalvular space. The remarks which I have made respecting colour, both in health and disease, are also applicable to this portion; but the occurrence of the *valvulæ conniventes* calls for an additional remark, which may be applied to the whole of the remaining portion of the small intestine, namely, that the edges of these *rugæ*, in conformity with the observation which I have offered respecting the *rugæ* of the mucous membranes generally, are particularly liable to injection. This injection of the edges of the *valvulæ conniventes* is very striking, where a cause of irritation has existed; and I believe it may sometimes be seen when the injection is congestive, though in these latter cases it is generally more diffused. Even the staining with bile is often most conspicuous at the edges of the *valvulæ conniventes*.—This part of the intestine is not unfrequently of a grey, and even of a dark grey, from an alteration of the colouring matter of the blood in numerous minute points.

*Valvulæ
conniventes.*

Inflamma-
tion.

The inflammation of this part of the duodenum has claimed the special attention of Broussais and his disciples. His son has written a moderate-sized pamphlet specially devoted to this subject. The interest of this party does not, however, appear to have been so much excited by the evidence of morbid appearances observed in this part of the duodenum, and which I regard as few and for the most part inconsiderable, as from theo-

retical notions respecting duodenitis as the first part of disease, which, eventually, is more remarkable in other organs. They consider that duodenitis is the principal, nay, almost the sole cause of derangements of the liver and pancreas, and their ducts: they contend, that as the testicles become inflamed, as a sequel to inflammation of that part of the urethra at which their ducts empty themselves, so the influence of inflamed duodenum is propagated along the biliary and pancreatic ducts.—Thus duodenitis becomes, according to these theorists, the cause of hepatitis, of fat liver, of many cases of jaundice, of scirrhus pancreas, &c. This view is so little supported by evidence, that it scarcely requires the trouble of refutation. Though the derangements of the liver often come on so insidiously, that it is difficult or impossible to revert to the time and symptoms of their invasion, yet it is known that some of them are the consequence of causes which appear directly to act upon the liver. Mercury is one of these agents; the abuse of which appears to produce serious organic derangement of the liver, without any manifest effect on the duodenum. A similar remark may be made with regard to the influence of warm climates, and of intermittent fevers; which latter appear to derange the liver, by the disturbance which they produce in the circulation. The derangement in the dram-drinker's liver I am very much disposed to attribute to vitiated blood, conveyed to the liver by the vena portæ. I know of no plea for connecting fat liver, and some other derangements of the organ, which it would be out of place to notice here, with inflammation or any other derangement of the duodenum.

Broussais' view of duodenitis.

With respect to jaundice, I am ready to concede that there is more probability that some cases of this affection may very plausibly be referred to the state of the duodenum. I have examined the bodies of patients who have died in a state of jaundice, in whom no derangement could be detected in the course of the ducts which contained and

Jaundice.

allowed the passage of bile. In these cases, it seemed highly probable that the impediment had existed at the mouth of the ducts towards the intestine, which is also naturally the narrowest part of the passage. The manifest relief at times afforded by means which act gently on the alimentary canal seems also to favour the idea, that the cause of obstruction, and the application of the remedy, are both to be referred to the duodenal extremity of the ducts. Another argument in favour of this view of the case may be drawn from the healthy and physiological flow of bile. We conclude that it does not at all times flow, at least with the same degree of freedom, into the intestinal canal, but makes its way into the gall-bladder, which it occasionally fills to great distension:—the occasional impediment must therefore exist somewhere between the junction of the hepatic and cystic ducts, and the opening into the duodenum. Now, in the natural state of parts, I do not think that we can discover any mechanical explanation for the obstruction of the bile through the ductus communis: we are therefore almost reduced, by a process of exclusion, to look to the duodenal extremity for the cause of the impeded flow.

Dr. Stroud's
opinion.

It is the opinion of my friend Dr. Stroud, which he supports with his usual acuteness, that the flow of bile into the intestine is promoted by an influence exerted in or by the intestine at the extremity of the duct; as the flow of saliva is promoted by causes applied to the termination of the salivary ducts. With this view respecting the natural flow of bile, it is perfectly consistent to suppose that jaundice may sometimes be occasioned by the suspension or alteration of this influence. A fact noticed by my friend Thomas W. King seems to afford another degree of probability to the opinion of Dr. Stroud. In a case of cholera, a disease peculiarly remarkable for its influence on the alimentary canal, both with respect to the secretion from its lining membrane and the excessive and often perverted action of its contractile fibrous coat, as evinced by urgent vomiting

and forcing diarrhœa—a disease in which the flow as well as the production of bile is interrupted—he discovered bile in the pancreatic duct; a fact which could not have taken place if the bile had not reached almost within a hair's breadth of the intestinal end of the duct, since it is in the parietes of the duodenum that the union of the biliary and pancreatic ducts take place: yet even here an obstruction must have existed, to prevent the bile taking its usual course to the intestine, and turn it aside into the pancreas. This suspected influence of the duodenum, by which it either promotes the flow of the bile by a kind of emulging, or interferes with it by constricting the termination of the duct, is a subject which I would recommend to your further attention, as one which is not only curious, but of practical interest.

It does not appear, from the results either of my own inspections or of those of others, that this portion of the alimentary canal is often the seat of morbid appearances. It may share with other parts in exhibiting characters of a general description, and common, under certain influences, to the greater part of the alimentary canal; such as, injection from congestion, from irritation excited either by disease or various swallowed irritants, or the opposite state occasioned by general anemia; or it may be stained, in common with other parts, by the contents of the intestines; as, for example, when nitric acid has been swallowed, when the whole or greater part of the canal presents a greenish yellow tinge. Besides these general appearances, there are few morbid alterations specially belonging to this part: thus, I have never heard of stricture or intussusception; even ulceration is very rare, except in those cases to which I have already alluded, in which softening of malignant tubercles, or the opening of an abscess situated in its neighbourhood, has produced such an effect.

BILIARY DUCTS.

Biliary
ducts.

Before I proceed to the remaining portion of the duodenum, I must notice those prolongations of the mucous membrane of the alimentary canal which are in connection with this part; namely, the biliary ducts and bladder, and the pancreatic ducts. In noticing these ducts, I shall of course confine myself to the trunks and larger branches; the consideration of the smaller branches being inseparably connected with that of the glandular structure itself. The mucous membrane lining the biliary ducts differs materially, in appearance and structure, from that of the intestine to which it forms an appendage: it is of a paler colour, and much denser structure; and instead of its surface appearing villous, it is almost as smooth as a serous membrane. It exhibits different appearances in different parts; the description of which belongs to special, rather than to general or pathological anatomy.

Character of
the biliary
ducts.

The large branches in the liver are characterized by the openings for the reception of the small ducts;—that of the ductus cysticus by the remarkable spiral fold which gives to this part of the canal somewhat of the character of the cochlea: and in the ductus communis it has a reticulated character, which bears a slight resemblance to the honey-combed appearance of the mucous membrane of the gall-bladder, although on a much smaller scale, and of considerably denser structure.

Deficiency,
general,

Total deficiency of the biliary ducts is met with in those cases of monstrosity in the foetus in which the liver is wanting; and this deficiency of the liver appears invariably to take place in those foetuses in which the head and neck and part of the thorax are wanting. This deficiency is the more remarkable, since in these cases other and less-important abdominal viscera are present, and generally well formed. Such deficiency deserves consideration, as it appears to bear essentially on the views of some physiologists on the nutrition of the foetus and the formation of the particles of its

blood, to both of which the liver is by them regarded as essential.

A partial deficiency of the ducts is seen where the gall-bladder, and consequently the ductus cysticus, are wanting. partial,
 An acquired or secondary deficiency is sometimes produced acquired.
 by obliteration; and is consequently a sequel to an affection, Excess.
 which remains to be spoken of. The only kind of excess in these parts, which I remember to have met with, consists in dilatation, which is sometimes very considerable. It takes place as the result of some mechanical obstruction to the ducts emptying themselves into the intestine. The most common causes of such obstruction are enlarged and indurated glands about the head of the pancreas and tubercles, chiefly of a malignant kind, either situated in the same parts, or developed in the substance of the liver itself, or gall-stones lodged in the duct. Under the influence of these causes of distension, the larger branches of the biliary ducts are occasionally so much dilated as to be able to receive a finger, or even the thumb. The ducts thus enlarged are generally filled with a thin watery fluid, very different from that of the secretion of most of the mucous membranes. It is generally discoloured with bile, which in most cases is of a greenish colour, from retention:—you will doubtless recollect that I have adverted to this change of the colour of the bile, in my remarks on the subject of colour. The character of the fluid contained in the dilated hepatic ducts is worthy of some attention. It might be conceived, *à priori*, that it would consist of suppressed bile, and become progressively thicker and darker in proportion to the time of its retention:—the reverse of this is precisely the case, since in proportion to the degree of the dilatation of the ducts are their contents thin and watery, and apparently the product of their own secretion.—The suspended secretion from the liver, in these cases, is interesting; but it bears rather on the subject of glandular structures, than on that with which we are occupied to-day.— Dilatation.

When the biliary ducts are considerably distended, those minute irregularities which give to the internal surface a honeycomb or reticulated appearance are nearly or quite obliterated; insomuch, that it has almost the smoothness of a vein.

Elongation. The ductus communis seems to be liable to an alteration in its dimension, in length, as well as to the dilatation of which I have been speaking. I have already incidentally noticed the projection of the opening of the biliary and pancreatic ducts into the duodenum: the cause of this, in the instance which I have at present in view, appears to be the prolongation, protrusion, or prolapsus of the common duct, in consequence of the retention of a biliary calculus; which having all but escaped the biliary passages, became firmly lodged at the very mouth of the duct, where it formed a complete impediment to the passage of the bile which was continually pressing upon it from behind. The obstructed duct occasioned a nipple-like projection from the internal surface of the duodenum, about half, or two-thirds, in length. It was not accompanied by eversion, as in the prolapsus of some other parts;—the surface of this projection being covered by the lining membrane of the duodenum, and not by that of the duct. I conceive that the cause of this prolongation of the duct is not wholly to be ascribed to the pressure of the fluid in the duct behind the impacted calculus, but, in part, to the action of the peristaltic movement of the intestine and its contents upon the calculus in the first instance, and upon this and the protruded duct as soon as this state had commenced. We shall have occasion to notice an analogous effect taking place in the colon.

The biliary ducts may be elongated to a considerable extent by causes which displace that part of the duodenum with which they communicate. This effect has been produced by tumours situated over the bodies of the vertebræ.

Inflam-
mation.

The mucous membrane of the biliary ducts seldom exhi-

bits indication of inflammation: I think, however, that it may be at times preternaturally reddened, as the effect of irritation. I know of no instance of its becoming ulcerated, except from without; as when a softened tubercle finds a way of escape, by ulceration, into one of these ducts. That they are liable to inflammation, is evident, from the traces of it in the permanent effects which it leaves when it has itself wholly subsided: these effects differ from those which we observe in any part of the mucous system with which we have at present been engaged; except, perhaps, in a slight degree in the œsophagus; and in one other portion, which I merely mentioned without entering into any of its affections, since they seem more closely to belong to the class of diseases of the eye, which are under the special notice of a more able teacher than myself. The part to which I allude is the lachrymal duct and sac. The particular derangement to which I am now referring, as a sequel to inflammation, is a more or less complete obliteration, occasioned by the thickening and contraction of the coats of the duct, and the adhesion of its internal surface; a change which bears some analogy to that which we shall have to notice in the ureter and urethra. The inflammation which leads to this thickening and contraction, with more or less complete obliteration, may often be ascribed to the mechanical irritation produced by the passage of a gall-stone: nevertheless, this state has been found in a very young subject, in whom nothing like gall-stone existed, and in whom it was extremely improbable that biliary calculus had ever been formed. By far the most common seat of this derangement is in the ductus cysticus. The greater liability of this part may depend upon the office which it has to perform, in conveying the bile to as well as from the gall-bladder; in which latter case, not merely the consistence and properties of the bile may have been altered, but it may contain small but sharp grains of sabulous form, and calculi of various size and shapes. The tortuous as well as contracted figure of this part of the

Contraction,
and oblite-
ration.

biliary ducts is another circumstance which favours the obliteration in question.

Emphysema
of the sub-
mucous cel-
lular mem-
brane.

Supposed
spasm of a
supposed
muscular
coat.

The comparatively dense character of the hepatic ducts seems to exclude the idea of there being much cellular membrane subjacent to the mucous lining; and it does not appear that this cellular membrane is often the subject of derangement. Dalmas jun. has related, upon the authority of Andral, a case in which this submucous cellular membrane was the subject of emphysema: it concurred with jaundice, of which it appeared to have been the cause. I do not know that it has ever been found œdematous, infiltrated with pus, or preternaturally softened; but this may, in part at least, be attributed to the condition of this structure not having been often specially looked into. A muscular structure is attributed to these ducts rather theoretically than as the result of demonstration; and the supposed spasm of the supposed muscular coat has been referred to as the not-unfrequent cause of jaundice. I am not prepared to deny the existence of any traces of the contractile fibrous coat in the composition of the biliary ducts; but it is certainly not very evident, and I cannot call to mind any appearances tending to favour the idea that temporary and spasmodic contractions take place in this canal. The admission of an influence exerted at the extremity of the duct, for which I have already contended, and which is certainly supported by a greater degree of probability, will sufficiently account for various cases of transient jaundice, without having recourse to hypothetical spasms of the ducts.

GALL-BLADDER.

The gall-
bladder—
peculiarities
of its mu-
cous mem-
brane.

The gall-bladder possesses some peculiarities of structure, which, as well as its office, render it necessary to take up its derangements separately from those of the biliary ducts. The mucous membrane by which the gall-bladder is lined is of a much looser and softer texture than that belonging to the ducts. Its surface presents an almost infinite number

of plicæ, of great tenuity in proportion to their elevation: they variously intersect each other, producing a reticular appearance, which gives it, on a very small scale, much of the character of that stomach of a ruminating animal which is called "the bonnet." The cells thus produced have been compared by Kiernan, who has written the most elaborate account of the liver which we possess, to the numerous broad and shallow depressions which are sprinkled all over the surface of the hepatic, cystic, and common ducts. In the bottom of some of these latter, a smaller depression, almost resembling the prick of a pin, but having very little depth, is regarded by Kiernan as a follicle for the purpose of secretion. In the mucous membrane of the gall-bladder I have not observed these smaller depressions, nor seen any appearance indicative of follicular apparatus as superadded to this part of the mucous system. The cellular membrane interposed between the coats of the gall-bladder is, comparatively, loose and mobile. The gall-bladder is possessed of a distinct coat of contractile fibrous tissue; but it is often so thin, that its existence might be called in question. Its peritoneal covering, with which it is only imperfectly invested, does not, for our present purpose, require any description.

The secretion from the internal surface of the gall-bladder is most decidedly mucus; but it is, in general, so completely intermixed with the bile which it receives, that it is only under certain circumstances that we can see and examine it in a separate form. We may do this when the cystic duct has been obliterated at a time when the gall-bladder contained little or no bile. The accumulated pure secretion of mucus from the gall-bladder has then been found perfectly transparent and colourless, and possessing, in consequence of the peculiarity of its refractive power, an appearance similar to that which is found in some bright crystals, and is termed their water. Such accumulations of clear mucus have been recorded as examples of white bile; when, in fact, they are totally void of bile, and quite inde-

Its secretion.

pendent of the secretion of the liver. I have found more than an ounce of this glary mucus, of a remarkably ropy character, in the gall-bladder of a child between two and three years of age.—It more often happens that the gall-bladder appears to contain a remarkably pale and dilute though ropy bile, which, though it may in part depend on the original character which it brought with it from the liver, is, I believe, chiefly dependent on the admixture of an unusual proportion of mucus from the gall-bladder itself. Most of the other deviations from the natural appearance of bile in the gall-bladder may be attributed either to the derangement of the function of the liver, or to variously-protracted retention, which not only alters the colour, but likewise the consistence.

Deficiency
of the gall-
bladder:

preternatu-
rally small:

I have already noticed the total deficiency of the gall-bladder. This anomaly presents an analogy with the conformation natural to some animals; as, for example, to the horse. The gall-bladder is sometimes remarkably small: I have occasionally seen it internally scarcely larger than a full-sized horse-bean. In these cases, its parietes have proportionately been thick and indurated; whence it would appear that the gall-bladder had contracted, after being the subject of severe inflammation. Sometimes gall-stones are found closely impacted in these contracted gall-bladders; and, in other instances, appearances are met with which seem to indicate that gall-stones had made their way, by ulceration, into the intestines:—but of these appearances I must speak hereafter.

preternatu-
rally large.

The gall-bladder sometimes acquires enormously-increased dimensions. I have seen one belonging to the Museum at St. Thomas's Hospital, which, when recent, must have contained upwards of a quart. One of our preparations exhibits a considerable distension; and, as it has been preserved as a wet preparation, we have the advantage of seeing the condition of the several coats. The mucous membrane, which had evidently been put greatly to the

stretch, has its plicæ almost obliterated; but there are delicate lines, of scarcely any elevation, which mark their original situation and direction, and point out the great enlargement of the areas which they enclose. The texture of the mucous membrane is not manifestly thickened; but there seems to be a very little increase of thickness and density in the coats generally, which it is not easy to refer to each individually. The contractile fibrous coat has probably had its share in producing the effect; which has, perhaps, principally rested with the cellular membrane.

I am not aware that it has ever occurred to me to see the effects of recent acute inflammation of the mucous membrane of the gall-bladder: but I once attended a lady who frequently suffered from distressingly-acute pain in the situation of the gall-bladder, attended with slight appearance of jaundice: the severity and frequency of the attacks greatly reduced her flesh and strength, and she ultimately sunk under one of them. At the inspection, at which I was not present, traces of inflammation, with softening and ulceration of the gall-bladder, were detected.

Acute inflammation.

I have seen more or less extensive ulceration of the lining membrane of the gall-bladder; but these cases seemed to have been of a chronic character; and, in one instance, cicatrization appeared to have been nearly or quite completed.

Ulceration.

Ulceration of the gall-bladder is sometimes produced by the mechanical irritation of gall-stones; and in these cases all the coats of the gall-bladder are liable to be ulcerated: and on the escape of the gall-stone, the cavity of the gall-bladder is completely, or to a great degree, obliterated, and its coats reduced to a condensed and corrugated mass, adherent to one or more of the neighbouring parts. The course taken by gall-stones thus escaping from the bladder is by no means uniform; but they most frequently find their way into the intestinal canal, either to the small intestines, or directly into the colon. In this way, gall-stones of enor-

Perforation
by—
gall-stones,

abscesses,
softened tu-
bercles, and
malignant
tumours.

mous size have been voided during life. Gall-stones sometimes make their way by effecting an opening through the parietes of the abdomen. The gall-bladder is sometimes ulcerated from without, inwards, in consequence of abscesses and softened tubercles, scrofulous or malignant, making their way, by ulceration, into the cavity of this organ. The mucous membrane of the gall-bladder may be perforated by sharp calculi lodged within it. I have met with an angular fragment of gall-stone which had passed the mucous membrane and had lodged in the substance of the gall-bladder. The opening through which it passed had been closed, without leaving any trace of its existence.

Malignant
disease of
the mucous
membrane.

The gall-bladder is not only liable to be affected with malignant disease by extension of the morbid growth from other parts, but it may become primarily the subject of such affection itself. Thus, malignant disease may attack the mucous membrane, and produce a circular, well-defined spot, with rounded edges of considerable thickness. An example of this kind occurred in the gall-bladder of a middle-aged woman, whose liver was the seat of fungoid tubercles of large size and rapid growth, of soft texture, and lobular form*. The fungoid granulations of the mucous membrane of the gall-bladder had scarcely arrived at the ulcerated stage, when the woman died.—Malignant tubercles are sometimes developed in the cellular membrane between the mucous and other coats of the gall-bladder. I have also found the gall-bladder affected with malignant disease when in conjunction with ulceration of the internal surface: there was so much infiltration of the other coats, that it was impossible to say to which texture the disease primarily belonged, or whether it had been propagated from some neighbouring parts which were affected with the same disease. This indistinctness was completely analogous to the

Of the sub-
mucous cel-
lular mem-
brane.

* Louis mentions a sort of loose brown tuft, an inch in length, attached to the mucous membrane of the fundus of the gall-bladder, in a woman fifty-three years of age.

state which I have noticed in speaking of malignant disease of the stomach: in fact, the gall-bladder, in this instance, most strikingly resembled a cancerous stomach in miniature.

The submucous cellular membrane is occasionally the seat of œdema, by which the coats of the gall-bladder appear to be very much thickened; but on pressing them between the fingers, serum escapes from the incised surface, and the coats resume their usual thickness. Œdema of the gall-bladder is met with in ascites, and other hydropic affections, whether the cause exist in the heart, liver, or kidneys. In conjunction with this effusion into the cellular membrane of the gall-bladder, in which the subserous cellular membrane participates with the submucous, we may not unfrequently find the lymphatics of the gall-bladder large and visible. The fluid contained in them has been found tinged with bile. I have seen the cellular membrane of the gall-bladder in a ragged sloughing state, in a case in which disease contiguous to the gall-bladder occasioned a perforation from without, inwards. In this case, the mucous membrane was perforated by several apertures, analogous to the perforations in the common integuments when the subcutaneous cellular membrane sloughs. I do not recollect ever to have met with that general softening of the submucous and subserous cellular membranes which favours the universal separation of the different coats, and is not unfrequent in the intestinal canal. This may, in degree, be ascribed to this state not having been particularly sought for; nevertheless, I am inclined to believe, that neither the functions of the part, nor the derangements to which it is liable, are so likely to produce this change, as in the case of the intestines; seeing that the serous membrane of the gall-bladder does not often participate either in chronic or acute peritonitis, and that the movements of the contractile fibrous coat are, in all probability, neither so strong nor so frequent as those of the middle coat of the intestines.

Œdema of
sub-mucous
cellular
membrane.

Sphacelated.

Contractile
fibrous coat
indistinct.

Hypertro-
phied,

Contracted.

Wounds of
the gall-
bladder.

Duct of the
pancreas:

its charac-
ter:

I must now say a few words respecting the contractile fibrous coat.—As I have already stated, this coat in the healthy gall-bladder is very indistinct: it is, however, at times rendered very evident by the hypertrophy which it undergoes; when there exists a cause for increased force in the contraction of the gall-bladder; as, for example, when gall-stones are lodged within it, when contraction is probably increased, not merely by efforts to expel the calculi, but also in expelling the bile, the flow of which may be impeded both by the calculi and by its own consistence. Such thickening of the contractile coat of the gall-bladder is analogous to that of the detrusor urinæ, in conjunction with stricture of the urethra. The contractile fibrous coat of the gall-bladder sometimes effects the complete evacuation of the bile, and brings the gall-bladder into so contracted a state, that it does not fill the depression in the liver in which it is lodged: this, however, is not common; for we far more frequently find the gall-bladder pretty full of bile. In one case, in which the gall-bladder was greatly contracted, I observed that the peritoneal coat seemed to be left by the other coats which had contracted within the marginal limits of the depression in the liver;—a fact which illustrates the laxity of the subserous cellular membrane of this part.

Wounds of the abdomen have penetrated the gall-bladder. One instance is recorded, in which the patient recovered, notwithstanding the escape of a large quantity of bile into the peritoneal cavity. In another case, the injury was fatal.

OF THE DUCT OF THE PANCREAS.

In speaking of this duct, I shall only notice the principal duct and its larger branches, as the smaller necessarily belong to the consideration of the pancreas itself. The duct of the pancreas is a much more thin and delicate canal than the biliary duct; so thin, indeed, that, in its healthy state, it is often translucent, if not transparent: it is also surrounded

by a thinner and looser cellular membrane, by which it is connected to the neighbouring parts. The internal surface of the pancreatic duct is somewhat similar to that of the biliary ducts, but the reticular appearance is much less evident than in these last. A very small space at the junction of the pancreatic and biliary ducts seems slightly contracted. to differ from each of these: it is paler, and perhaps a little thicker: the paleness, however, may in part be ascribed to the pancreatic secretion washing off the bile, and preventing the membrane from being stained by it. The pancreatic duct is sometimes extremely small; but as its texture may at the same time be altogether healthy, the smallness must not be regarded as a morbid anomaly. The duct is sometimes contracted, or even obliterated, in conjunction with the thickening of its coats and neighbouring cellular membrane; which state is evidently the sequel to inflammation, by which the duct may only have been secondarily effected. The duct of the pancreas is liable to considerable distension, from mechanical causes. I have known it almost dilated. large enough to admit my little finger, in a case in which the biliary ducts were likewise obstructed and dilated in consequence of a tumour near the head of the pancreas*.

In a case in which small fungoid tubercles were scattered through the substance of the pancreas, the obstruction to the ducts caused the accumulation of the secretion, and the formation of two cysts resembling ranula, each of which was nearly as large as a pigeon's egg. Cysts like ranula.

I have but a very few words to offer respecting the last portion of the duodenum; since, in its structure as well as in the appearance which it presents, it very much resembles the jejunum, of which I shall have next to speak. Its movements, however, are more restrained: its valvulae conniventes, and its solitary glands, are rather more numerous. I think it is less liable to distension, and is consequently of Last portion of the duodenum.

* Pus and calculi have been found in a distended pancreatic duct.

smaller size than the jejunum; and, as far as I know, it is never the seat of intussusception.

JEJUNUM.

Jejunum.

The next portion of the small intestine to which the name of jejunum has been given, has very few morbid appearances specially belonging to it. It may, I believe, be considered as the part of the intestine in which pathological appearances are the least frequently met with. As there is no natural boundary marking the passage from the duodenum to the jejunum, and from the jejunum to the ileum, the condition of the middle portions of the small intestine are often spoken of without reference to these artificial divisions. On this account, I shall first notice a few points which appear to me more especially to belong to the jejunum, and afterwards speak of some appearances common to it and other parts of the small intestine.

Character.

The jejunum exhibits considerable variety in its size, independently, as it would appear, of any morbid condition. It is sometimes small, and appears as if spasmodically contracted, or its coats may seem wasted by emaciation: at other times, it is large, with thick coats, even when there does not appear to have existed any stricture in the inferior part of the intestine, and, in fact, when it is found, after death, not to contain any more than its own secretion.—I believe that the jejunum may safely be regarded as the portion of small intestine which is naturally of the largest size.

Variety in size.

Variety in colour.

I believe that the natural colour of its mucous membrane is as pale, and even white, as Billard has described that of the healthy undigesting stomach to be. This natural colour is less frequently perverted by morbid and cadaveric alterations than most other parts of the canal. Amongst the cadaveric appearances, the most frequent is, perhaps, the staining with bile; which is generally most considerable at the edges of the valvulæ conniventes, but not confined to

them. Billard considers the yellow colour as nothing more than the natural white stained with bile. The mucous membrane may be stained by the ingesta which have passed through it, but this is seldom the case. The depending portions may be coloured by cadaveric congestion, and the blood so injecting it may be altered by gases and secretions. The mucous membrane of the jejunum is sometimes of a greyish colour, from very minute black points sprinkled over it. These points appear to consist of villi, in which the blood by which they are injected has been altered by stasis or gases. This grey colour, therefore, admits of the application of the remarks which I have already repeatedly offered respecting mucous membranes, when presenting this colour. It may exist independently of disease; or it may depend on disease which has subsided; or it may be connected with a recent morbid state. The mucous membrane of the jejunum is distinctly villous; and the appearance which is sometimes observed when man and other animals have suddenly died during the activity of the process of digestion, namely, that of the villi presenting one or more branches of lacteals filled with chyle, is, perhaps, more frequent and more conspicuous in the jejunum, and the part of the duodenum which we have last considered, than is the case with inferior portions of the intestine. This injection of the villi with chyle is not often seen; for the obvious reason, that persons do not often die during the activity of healthy digestion; and when they do so, from accident or other causes, the inspection which may be desired, even for judicial purposes, is apt to be too long deferred for the appearance in question to have continued visible. The *valvulæ conniventes* of the jejunum, though perhaps not so numerous as those of the duodenum, are generally very striking; being, if I am not mistaken, larger and broader than in any other part of the canal, and often exhibiting that overlapping appearance which Billard has described as imbricated. The internal surface of the jejunum is generally

Lacteal vessels in the villi filled with chyle.

Valvulæ conniventes.

Secretion
increased :

altered.

lubricated with rather an abundant secretion of mucus, which is mostly of an opaquish white colour. It is probable that the intestinal mucous secretion is more often seen in a tolerably pure state in the jejunum than in some other parts of the canal, from the alimentary matter being, as it would appear, detained for a comparatively short time in this intestine. The secretion in the jejunum may be morbidly increased ; as, for example, when the *ascaris lumbricoides* or the *tenia solium* are lodged in it : they are generally accompanied by a copious secretion somewhat resembling stationer's paste, without the membrane which it bathes being sensibly altered either in colour or texture ; although a remark of Professor Monro's, as well as the opinion of Broussais, support the contrary, and favour the idea that inflammation accompanies the presence of worms. The secretion is sometimes copious and watery, with intermixed curdly particles : sometimes it is more completely serous. But I shall not now dwell on this appearance, which is by no means confined to the jejunum, and merits particular attention.

Preternatural distension.

Although, as I have before stated, the jejunum admits of considerable variety in size, independently of any morbid condition, yet I believe that it is at times of a size which must be regarded as morbid. This is obviously the case when, as is the consequence of stricture in an inferior part of the canal, the calibre becomes greatly enlarged, and the parietes proportionably thickened. Such distension is, however, more frequent in the ileum. I shall therefore have occasion to revert to this subject.—The enlargement which I conceive to belong more especially to the jejunum is that which I think I have not unfrequently observed in persons of a great degree of corpulency, shewing itself more especially in the prominence of the abdomen. It is by no means improbable that the abundance of fat in the abdomen may interfere with the peristaltic movement of the intestines ; and thus occasion the accumulation of contents, with-

out the existence of any stricture to produce it. It seems probable, that in those individuals who are remarkable for their obesity in the form which I have mentioned there is also a preternatural laxity, and want of tone, in the solids, which predisposes them to give way to distension, and also diminishes their resilience when the distending cause is removed. The remarkable, and to me inexplicable circumstance, is, that the jejunum should be particularly affected, seeing that it seldom retains alimentary matter.

In cases of poisoning with arsenic and some other acrid substances, the jejunum has participated in the inflammatory redness which pervaded the alimentary canal; and I also think I have seen this the case when intense redness of the small intestines has been the effect of an acute disease speedily occasioning death. The mucous membrane of the jejunum also participates in the congestive redness produced by disease of the heart, liver, or lungs. Injection, however, is more often partial than diffused, in this as well as in other intestines; and the edges of the valvulæ conniventes are the situations in which it is most frequent and intense. The jejunum is rarely the seat of ulceration: when ulcers do occur, they are few and scattered, and concurring with others more numerous and strongly marked in the ileum. They are mostly the consequence of softening of tuberculous matter deposited in the submucous cellular membrane, and probably connected with the solitary glands. The aggregate glands, or those of Payer, which are seldom visible in the jejunum, have, I believe, been sometimes found participating in the morbid condition of those more strongly marked and more seriously affected in the ileum. The submucous cellular membrane of the jejunum is liable to œdematous infiltration with serum, in cases of ascites. Blood has been found effused in the same structure, but to a small extent, in a case of colica pictonum. I have once seen small circular collections of a white fluid, resembling chyle, scattered under the mucous

Inflam-
matory and
congestive
injection.

Ulceration.

Œdema, and
effusion of
of blood, in
submucous
cellular
membrane.
Small de-
fined collec-
tions of
chyle.

Hernia of
the jejunum.

membrane of the small intestine : the largest of these scarcely equalled the size of the disc of a split pea. I cannot say that this appearance belonged to the jejunum, but I suspect that it did so. The jejunum may be the subject of hernia; but I do not think that this is a frequent occurrence, or that there is any symptom specially connected with it when it does take place.

Rupture
from external
injury.

The jejunum has been ruptured by injury inflicted on the abdomen; and, what is very remarkable, the patient has survived such an injury two days.

General re-
marks appli-
cable to the
middle por-
tion of the
small intes-
tine.

Other morbid appearances occasionally discovered in the jejunum I shall notice in a few general remarks upon the morbid appearances observable in the middle portion of the small intestine. The extent of this portion of the alimentary canal differs considerably in different individuals. A difference, amounting to several feet, is observable in the whole length of the alimentary canal; and the parts on which the difference depends are necessarily the portion of the small intestine which we are now considering, and the colon. A deficiency in this part, amounting to a morbid character, is, I believe, only met with, as original conformation, in monstrous fœtuses. As an acquired deficiency, it is not very unfrequent as the result of the contraction which follows chronic peritonitis, which has the effect of investing the alimentary canal in a false membrane. I believe that the small intestine has been shortened by some feet in this manner. The intestine so shortened seems to be thickened; though little, if at all, dilated. On laying open an intestine in this state, its increased thickness is found in part to depend on œdema of the cellular membrane between the coats, especially of the submucous cellular membrane. The apparent thickening is, however, in part attributable to the drawing together of the valvulæ conniventes; which, in a given space, become more numerous than is usual, and considerably overlap each other. Sometimes, without any notable diminution in length or calibre, there is a great and

Shortening
as a conse-
quence of
peritonitis.

general emaciation of all the coats, so that they can scarcely be distinguished from each other, and the contractile fibrous coat appears to be nearly or quite wanting; the villi on the surface of the mucous membrane are less conspicuous; and the valvulæ conniventes are scarcely visible. The mucus is produced in small quantity, and is of little consistence: where the intestine is distended with gas, it is generally wanting, leaving the membrane nearly dry. This defect of secretion, and flatulent distension, are not to be confounded with the somewhat similar state which is the effect of inflammation. That of which I am now speaking seems to be principally the effect of emaciation; and the approach to dryness may be merely cadaveric. A partial deficiency may be seen in some cases of partial contraction; yet this deficiency is at times only apparent, being occasioned by temporary contraction of the middle coat. When the contraction is permanent, it is more often the sequel to inflammation affecting the mucous membrane and the cellular membrane, especially that beneath the peritoneum: thus it may be the sequel either to ulceration of the mucous membrane or to peritonitis, occasioning adhesions. Sometimes the size of the intestine is encroached upon by tumours in the mesentery, close to the intestine. From whatever cause this permanent partial contraction proceeds, the intestine for some distance above is dilated, whilst that below is contracted. Excess in this part of the canal, like the opposite state, may proceed from various causes. I am not aware of any preternatural length of the intestine to a degree to be regarded as morbid, or even to attract special attention: the only approach to these state of things is seen in some long diverticula; but as they seem to occur almost invariably nearly at the same spot, and that not far from the inferior termination, this anomaly will not strictly come under our present attention. Deviations characterized by excess in the small intestines, which we shall have to consider at present, consist of increased calibre and thickened coats. I have already noticed,

General
emaciation
of all the
coats.

Partial
contraction.

Dilatation.

and endeavoured to explain why we find this state in the jejunum, in persons affected with obesity. It is not by any means confined to the jejunum: the greater part of the small intestines may be in this state, but I think it generally diminishes as we approach the iliac valve. The most remarkable increase of size is the effect of permanent stricture in the intestine; and is found to be the effect of such a stricture, whether it is situated in the small or in the large intestines. The small intestines, under these circumstances, not merely equal the ordinary size of the large intestines, but may even greatly surpass it, and be four or five inches in diameter for a considerable part of their course. At the same time that the intestine is thus preternaturally dilated, its coats are generally thickened. This change principally takes place in the contractile fibrous coat. Both the longitudinal and circular fibres are greatly developed, and have a remarkably fleshy appearance; yet even in this case they decidedly fail to exhibit the true character of muscle. This thickening is evidently a real hypertrophy; and is probably occasioned by the frequent and powerful, but ineffectual efforts to propel the contents of the intestine. It might be supposed that the plicæ constituting the valvulæ conniventes would be obliterated in conjunction with this extreme distension. They may, I believe, be somewhat diminished, but their edges continue well marked. Partial increase in the size of the small intestines is more often apparent than real; being merely the effect of a temporary spasmodic contraction in one part, accompanied with flatulent distension in an adjoining part. Pouches, however, are said to have been formed by the lodgment of foreign bodies; as when indigestible materials of large size have been swallowed, or when concretions have gradually accumulated *in situ*.

Thickening.

Pouches.

Intussusception.

Intussusception, which is more often met with in the small than in the large intestines, appears to be common to the greater part of their extent, without distinction between the jejunum and ileum. It more often happens that invagina-

tion takes place by the superior portion being received into the inferior; but the contrary sometimes occurs. I have seen specimens of both modes, in the same subject. In considering intussusception, it is necessary to be aware of two distinct forms which it presents. The one is, a very serious affection, amply sufficient to occasion death, which it generally brings about, with a rapid train of urgent symptoms which bear the strongest resemblance to those produced by strangulated hernia; such as, obstinate and uncontrollable vomiting, the matter rejected consisting of bile of different colours mixed with the contents of the *small* intestines. There is obstinate constipation, great prostration of strength, rapid small pulse, reduced temperature, hiccough, and death. On examination, after a case of this kind, there are always marked traces of severe derangement of the part: the mucous membrane is strongly injected, sometimes of rather a livid colour, and covered with a muco-purulent secretion, or with a secretion approaching to the character of lymph. The entire substance of the coats is somewhat turgid; and I believe there are generally traces of peritoneal inflammation, though death generally takes place before these can become strongly marked. I once examined the body of a patient who had exhibited all the symptoms which I have described: they had, however, in some degree subsided before death, and stools had been passed. No invagination remained at the time of inspection, but it was evident that invagination had existed.

Two forms.

1st form.

CASE.

20. 5. 1830.—M. Smith, about 60 years of age, (a patient of Dr. H's and J. Saner's) who died the preceding morning about five o'clock. He had been attacked about ten or twelve days before, with a sudden accession of violent pain in the abdomen. The bowels were constipated, the stomach rejected aliment, and the vomiting continuing, the matter rejected had a dirty-brown colour and an offensive odour. Suspicions of hernia were excited, more especially as the attack occurred almost immediately after the patient made a strong effort; but nothing like

Case.

protrusion was discoverable at either ring. Injections and purgatives were tried without effect, and leeches were applied to the abdomen. Blood was likewise taken once or twice from the arm. Croton-oil at length procured a stool; but the stomach continued irritable, and there had been some hiccough. When Dr. H. was called, about six days before the patient's death, the bowels had been opened, but the vomiting of the dark offensive matter, and the pain of the abdomen, recurring at intervals and a little increased by pressure, still continued. The temperature of the body was cool; the pulse rather quick, but not strong or sharp; but it was irregular, and accompanied with tumultuous action of the heart, a symptom which had been noticed two years before, and which had not been accompanied by any marked symptom, such as anxiety, oppression, or syncope. By total abstinence from food, liquid and solid, with the exception of an occasional tea-spoonful of some simple fluid to moisten the mouth, the application of mustard fomentation to the abdomen, and a pill of hyoseyamus and opium, the irritability of the stomach was, to a great degree, removed. There was still considerable strength; but it was not practicable to give more than a very small quantity of the simplest food, such as, very thick mucilage, isinglass-jelly, and the like. A dose of ol. Ricini remained, and was followed by a stool. There was a slight and transient appearance of amendment. Sickness returned, though only for a very short period. The patient was very restless, often requiring to be assisted to change his position; sometimes sitting up; sometimes lying in one direction, sometimes in another. The temperature of the extremities had much improved, and was nearly or quite natural; and, the irregularity excepted, the pulse seemed much better. Two days before his death, he relapsed considerably from this apparently improved state: the surface, especially of the extremities, became cool and clammy; the pulse smaller and sharper. Small quantities of brandy, and dry warmth to the extremities, afforded temporary relief. The bowels did not act, but the abdomen was not more painful. The night before his death he vomited a little yolk of an egg beaten up. It had been retained some time; and was mixed with dark-coloured fluid, but little offensive.

Chest.—The right pleura was very generally adherent by means of adventitious cellular membrane, the effect probably of an attack of pectoral inflammation, from which the patient had suffered some years before. The left pleura was free from adhesion. The lungs were not unhealthy,

but there was some cadaveric infiltration in the posterior part. The pericardium was unusually free from fluid : indeed, nearly dry. The heart was rather large, but particularly broad at the base, and blunt towards the apex : the parietes were little thickened, and easily lacerated : the edges of the tricuspid valve were somewhat more thick and irregular than is usual : those of the mitral were considerably more so. There was likewise some unevenness of the curtains, near to their attachment ; and an appearance somewhat resembling a cicatrix, in which a slight deposit of bony matter had taken place. The interior of the auricle presented a slight irregularity, having a reticulated appearance. The semilunar valves were healthy, and the aorta presented only a few specks of opaque deposit.

Abdomen.—The abdominal parietes presented a considerable layer of fat. The omentum was large ; and was adherent to the mouth of rather a small hernial sac, on the right side. There was no intestine, and only a small portion of omentum in this sac ; and there was nothing like strangulation. The peritoneum generally presented rather a dusky colour ; but no appearance of inflammation, in the form of either fluid or coagulated effusion, except at the part to be presently mentioned. On raising the convolutions of small intestines, a portion of these, deeply placed in the left iliac region, was found of a dusky and somewhat livid colour, with two or three patches of tender lymph upon it. The moving of this part of the intestines led to the escape of very fluid feculent matter, of a dirty-brown colour. This was found to proceed from a small opening at that part of the intestine at which the discoloured part abruptly joined with that which was unaltered. The discoloured portion was about six or seven inches in length : it had no lymph, or purulent or membranous deposit, on its peritoneal surface, except on the spots before mentioned, beneath which the peritoneum shewed a tendency to ulceration or abrasion. The mucous membrane was of a darker colour than in other parts, but it was not altered in texture. The mesentery corresponding to the altered intestine was also of a darker colour than elsewhere, and had a greenish tinge. This appearance was abrupt ; and bounded by a defined line, in which ulceration appeared to have taken place. There can be little if any doubt that the appearance just described was the result of intussusception ; and that the invagination had ceased, though not until the intestine had been too much injured to recover itself. Had the invagination

remained, it seems next to impossible that the peritoneum could have put on the appearance above described : there would have been a more uniform deposit upon it, and the act of reducing the intussusception could not have been overlooked. The other parts of the canal offered nothing remarkable. Kidneys healthy. Liver tolerably so.

2d form of
intussuscep-
tion.

The other form of intussusception is rather to be regarded as cadaveric than morbid ; and it merits attention principally in connection with a caution against confounding it with the more serious form of which I have been speaking, and regarding it as the cause on which the previous symptoms had depended. This kind of intussusception appears to occur much more frequently in different parts of the same intestine than in one spot only. I have seen it in as many as five or six places in the small intestine of one individual. No evidence of inflammation attends these intussusceptions, either internally or externally : the received portion is a little contracted, and perhaps somewhat paler than the adjoining portion. The length of intestine invaginated sometimes amounts to several inches : at other times it is very short. It is found in persons who have died with different diseases and symptoms, and occurs in children and adults ; but is, I believe, rather more common in young persons. I have met it repeatedly in persons who have died of diabetes : but though this coincidence has arrested my attention, I am at a loss to conceive any necessary connection between this form of intussusception and the disease alluded to. I feel the strongest persuasion that these intussusceptions are produced in *articulo mortis* ; and are to be ascribed to the powerful peristaltic movement, which, if we may judge from what we see in inferior animals opened at the time of death, takes place at that period. A strong contraction at one spot, whilst the peristaltic movement is going forward in the adjoining portion, would be quite sufficient to account for invagination ; and appearances which I noticed in one case, in which invagination had just commenced, seem to confirm this theoretical explanation. I see no difficulty in accounting

Probably
takes place
in *articulo
mortis*.

for intussusception, when the inferior portion is received into the superior; on the same principle as that on which the superior is received into the inferior portion: and I do not think that there is any occasion to call in the assistance of inverted peristaltic action to explain it, though such a cause has been assigned by one pathologist. The fact which I have already stated, that invagination occurs in both directions, and this within a few inches of each other, would scarcely admit of such an idea.

Since I have formed these views respecting intussusception, I have learnt that Professor Monroe, in his *Morbid Anatomy of the Human Gullet &c.*, has also admitted of two forms of intussusception; the one attended with inflammation, the other not. The latter he considers a frequent disease of childhood; the former, of adults of advanced age. In opposition to this view, I may observe, that examples of invagination, attended with the most acute symptoms, and producing the most decided inflammatory effects, have occurred in the intestines of young children; and that I have seen striking examples of the other form, which I believe to be produced, in *articulo mortis*, in the intestines of adults. I cannot conceive the possibility of invagination taking place during life without the immediate production of the most alarming symptoms, whatever may be the age of the individual in whom they occur. The greater irritability of children, as exhibited by their involuntary as well as by their voluntary motions, appears sufficient to explain the fact, which I believe Dr. Monroe to have correctly stated, that that form of intussusception, which I believe to take place in the moribund, is more often to be seen in the bowels of children than of adults. An effect has been ascribed to intussusception, which I must notice before I quit the subject; although the effect produced more strictly falls under another head. It has been supposed that protracted intussusception may not only lead to the death of the invaginated portion, but that such an adhesion of the upper and

Opinion of
Dr. Monroe
questioned.

Sloughing of
a portion of
intestine,
from invagi-
nation.

lower portions may take place at the limits of the invagination as to allow of a separation of the strangulated portion, without any opening of the intestine having taken place: so that life has continued after the expulsion of the dead portion of intestine. Never having seen a dead portion of intestine so separated, I have no opinion of my own to offer respecting it; but it appears to me that the explanation by intussusception is attended with great difficulties, not only in consequence of the severe symptoms which the necessary degree of strangulation could scarcely fail to produce, but also from the injury which at the same time must be unavoidably inflicted on the mesentery.*

Altered
secretion:

Considerable variety is observed in the contents of the small intestines: and though these differences may in a great degree depend upon the nature of the ingesta, upon the mode in which that part of the process of digestion has been performed which belongs to a superior portion of the canal, and also upon the character of the bile and other additions, more especially of blood in different states which the ingesta may receive, the appearances of the contents of the small intestines are nevertheless in degree dependent on the state of the intestine itself. Thus a diminution of secretion from the mucous membrane of the small intestines may occasion their contents to be morbidly deficient in moisture; but I believe that they have never been found in the small intestine of a consistence at all approaching to that of scybala. A total but partial suppression of secretion, producing a state almost or quite amounting to dryness, is sometimes met with, but in parts which contain little or nothing but air. As this is a state approaching to inflamma-

* Since this Lecture was written, I heard, in the Medical Section of the British Association, at its Meeting in Bristol, the relation of a case in which several inches of intestine were separated and parted with during life. The drawing of the detached portion exhibited a considerable part of the corresponding mesentery; not only leaving no doubt that the tube was a part of the intestine, but also confirming the suspected mode of separation.

tion, I shall not say more respecting it at present. Sometimes there is a great abundance of secretion, which is occasionally mixed with the passing contents of the intestine, and renders them extremely fluid: at other times, the redundant secretion appears unmixed with the alimentary matter. We see the former state most remarkable in those cases in which an impediment exists, either in the large or lower part of the small intestines, when the contents of the intestines above the contracted part consist of undigested and excrementitious matter, intermixed with so much fluid as to give them the consistence of gruel: in other cases, the passing alimentary matter is not so easily mixed with the secretions. There is a considerable difference in the appearance of the secretions found within the small intestines, even when they are unmixed with alimentary matter. I have seen these contents abundant, but so thin and watery, that the lining membrane appeared wholly unprotected with mucus, the coats of the intestine not appearing unhealthy, but much attenuated. I have met with this state in emaciated and cachectic subjects, whose most remarkable symptom had been a tendency to ulceration of the integuments of rather a peculiar character. The ulcers had exhibited an obstinate indisposition to heal, accompanied with a remarkable freshness and cleanness, and having, in general, a well-defined circular figure. Ulcers of a similar character are seen upon the skin, in connection with great inanition, from deficient or very poor diet; but in such cases they do not necessarily possess the untractable character which belongs to those ulcers connected with the state of intestine which I have mentioned: the local process is probably the same, though the remote cause is different.

remarkably
aqueous:

Sometimes the secretion from the surface of the small intestine, though thin and copious, is not so purely watery as in the cases to which I have just alluded; but contains small opaque particles, which give a turbid or curdly character to the fluid: the extreme of this secretion constitutes

resembling
rice-water.

Remark on
the absence
of diarrhœa.

Secretion
resembling
paste :

Sanguinolent :

one of the prominent symptoms of cholera. It is not easy to ascertain whether such increased and altered secretion depends principally on the membrane itself, or on its glandular apparatus. It is by no means improbable that both are concerned. In cholera, as I shall hereafter notice, the glandular apparatus is evidently deranged ; but this did not appear to be the case in the first-mentioned examples, accompanied with the peculiar ulcers on the skin. It is worthy of remark, that secretion in the small intestines may be fluid and copious, and evidently accompanied with a great degree of irritation of their mucous membrane, without occasioning a remarkable degree of diarrhœa. This symptom appears to depend on the state of the large intestines, which may little if at all participate in the disturbance affecting the small intestines. I believe that the facts which I am now stating were confirmed in a few rare cases of cholera. I have repeatedly noticed the thick and pasty condition of the secretion of the small intestines. Though it is most strikingly seen in the jejunum, it is not confined to that intestine. Sometimes the secretion is sanguinolent, from bloody transudation, without apparent abrasion, as in cases where congestion is produced by disease of the heart ; but it must be admitted, that it is not easy to ascertain how far this is cadaveric, or may have existed during life.—The state of the mucous membrane beneath this secretion should be noticed in conjunction with it. When the membrane is reddened, and of a similar colour with the secretion, it is probable that this was produced, whether by a vital or cadaveric process, at or near the part at which it was found : but when the membrane beneath presents its natural paleness, it is more probable that the secretion has been conveyed from another part of the canal. When the blood proceeds from the stomach, it is generally of a dark or nearly black colour, both from detention, and from the action of the juices of the stomach. A deeply-tinged sanguinolent secretion in the small intestines, accompanied with intense injection, and thickening,

with some degree of extravasation, is met with in some severe cases of inflammation of the small intestines, consequent upon injury, and more particularly upon hernia. As I merely mention this fact, in this place, in connection with the sanguinolent secretion, I must revert to it when I come to speak of the membrane itself.

A milk-white fluid has sometimes been observed to run off from the bowels, constituting what is called lientery. It is supposed to depend on the want of absorption of chyle in the small intestines; but I know of no facts, observed on dissection, to confirm or refute this idea, the correctness of which I am disposed to call in question. I have never seen a decidedly puriform secretion from the small intestines: the nearest approach to it has been the nearly concrete non-plastic layer deposited on the surface of an invaginated portion of intestine.

resembling
milk.

OF THE APPEARANCES PRODUCED BY INFLAMMATION OF THE MUCOUS MEMBRANE OF THE SMALL INTESTINES.

These appearances are observable in the membrane itself, and in its glandular apparatus: they are often combined with each other; but I shall consider them separately, that the description may be more precise, simple, and intelligible. I shall commence by speaking of the appearances in the membrane itself. As is the case with other mucous surfaces, it seems that the first step in the inflammatory process is the suspension of secretion. I have already noticed this deficiency in the small intestines, as connected with inflammation; but it must be distinguished from that which seems to be independent of this cause. It does not often happen that patients are carried off in this early stage of inflammation of the mucous membrane of the small intestines. Some of the instances in which I have met with it, have occurred where there has been recent acute inflammation of the peritoneum, or perhaps some other acute abdominal affection. The internal surface of the intestine appears nearly dry, and at the

State of the
mucous
membrane.

same time it is reddened by minute injection: the edges of the *valvulæ conniventes* are more particularly affected: a small quantity of *fæcal matter*, or altered secretion, adheres to them, in an inspissated form; and, on attempting to remove it, the membrane beneath is apt to exhibit a partial abrasion. When this state of intestine exists at a part at which there happens to be a patch of aggregate glands, a similar adhesion of inspissated secretion is found upon its surface, as well as on the edges of the *valvulæ conniventes*.

Remark
respecting
redness and
injection.

Whether we examine an inflamed portion of small intestine in the state which I have just described, in which secretion is nearly or quite suspended—or, which is much more frequently the case, when secretion variously modified has been going forward—we find the mucous membrane itself reddened by the sanguineous injection of its minute vessels. This indication is so notorious, in the intestinal canal as well as in other parts, that it is more necessary to press the importance of refraining from admitting it as an evidence of inflammation, than to insist upon it as one of the proofs of the existence of that state. It is the fact, that such injections take place without inflammation, more remarkably in the stomach and small intestines, than in any other part of the body, which renders the inflammatory conditions of these parts, perhaps, the most difficult subject on which the practical pathologist can be called upon to form and express an opinion. The fallacy to which post-mortem appearances might lead us, is most evident in the case of the common integuments; upon which, on the one hand, we may find absolute paleness after death, where inflammatory redness had existed during life; and, on the other hand, red and livid patches and stripes of various degrees of intensity, the result of cadaveric injection, where there had been no redness or discolouration during life. This fact cannot be too constantly present to the mind, during the investigations of the morbid conditions of the alimentary canal. It is, I apprehend, much less likely that cadaveric paleness should

succeed to inflammatory redness in the case of the mucous membrane of the intestines than in that of the common integuments, seeing that the almost universal tendency of blood to leave the surface after death, which causes paleness in the one case, accumulates blood in the interior, and therefore tends to perpetuate redness in the other: but this very circumstance tends also to increase the congestive redness; and, as there are so many varieties, not only in the appearances of the injection, but in the consistence of the textures concerned, as also of their secretions, these congestions become a most fruitful source of error and doubt.

Billard, after a very careful and accurate investigation of the two forms of redness of the mucous membrane of the alimentary canal, gives the following summary of the comparison of the inflammatory with the passive redness:

Inflammatory.

1. Redness, either with or without perceptible thickening of the membrane.

2. Redness occurring indifferently with respect to the depending or superior position of the part.

3. Unaccompanied by general injection of the vessels of the abdomen, or obstacle to the course of the blood; and sometimes only consisting of a slight local injection.

4. With lacerability of the sub-mucous cellular membrane, and possibility of stripping off the mucous membrane in larger portions than can be done in the healthy state.

5. With thickening and abundance of mucous secretion, sometimes sanguinolent.

Passive.

1. The same remark applicable.

2. The redness almost always in the depending part.

3. With general injection of the vessels of the abdomen, and impediment to the course of the blood;—rather consisting in an isolated injection, but often occupying an entire convolution, or the whole of an intestine.

4. Without greater facility of taking off the lining membrane; which is only separable in small quantities, as in the state of health.

5. Without excess of mucous secretion, but sometimes accompanied by sanguineous exudation.

Billard's
distinctions.

Some of the points noticed in the Tabular comparison require comment and modification: some of these are furnished by the author himself, in other parts of his work.

Comments
on Billard's
distinctions.

The lacerability of the submucous cellular membrane, and the possibility of separating the mucous membrane itself in larger flakes than can be done with the healthy membrane, is not an invariable criterion of the inflamed state of the mucous membrane. When this membrane is recently inflamed, though it may be somewhat thickened, it is less tenacious than in health; and consequently, whether the subjacent cellular membrane be softened or not, it is not in a state to admit of the detachment of large shreds.

On a particular form of
softening of
the mucous
membrane.

The most remarkable and extensive separation of the mucous membrane from the other coats takes place, as I have before remarked when speaking of the peritoneum, when that membrane had been the seat of inflammation, and when the mucous membrane remains, to all appearance, healthy. The softening of the submucous cellular membrane, with thickening and firmness of the mucous membrane itself, to which Billard refers, is more strikingly met with in the stomach than in the small intestines, in which I cannot call to mind having seen this state existing to any marked degree. In certain states of the system there is a remarkable softness of the tissues, which must not be confounded with the effects of inflammation. It appears to be equally distinct from the softening occasioned by putrefactive decomposition; since it is met with in bodies opened as soon after death as it is proper for inspection to be made, and whilst the vital heat is yet present. This kind of softening is perhaps more often observable in the mucous membrane of the alimentary canal than in any other texture. It is very remarkable in the stomach: it is seen in the small intestines; and is also met with in the colon. In fact, it is, if any thing, more remarkable in the stomach and colon than it often is in the small intestines. The mucous membrane in this state is readily detached with the finger-nail,

which scrapes it off, almost reduced to the consistence of mucus. It may be of various hues and shades of colour; sometimes pale, but more often injected. The thickness and form of the mucous tissue is not, as far as I have noticed, conspicuously altered. Although I believe that this state of the mucous membrane requires further examination, I have seen and observed enough respecting it, to feel perfectly satisfied that it is not to be confounded with the effects of inflammation. On the other hand, the change is too great for it to be easily supposed that it can have been wholly produced in the short time which, in some instances, has elapsed between the death of the subject and the inspection. Again, had it wholly existed during life, it would appear impossible for so soft a texture to have retained its form, in opposition to the peristaltic movements of the intestines, and the passage of alimentary matters through the canal. I am therefore induced to suspect, that in this softening of the alimentary mucous membrane, as well as in similar softening of other textures, molecular changes have been going on for a limited period before death, which prepare them to undergo, after that event, more rapid alterations than are observed to take place in ordinary cases. I am induced to lay the more stress on this state, because it is not only essential to be on our guard against regarding the evidence of its existence as proof of previous inflammation, but because the investigation of the subject itself is calculated to throw light on other points of physiology and pathology. The softened state of the different textures, and of the mucous membrane of the intestines in particular, is met with both in those who have sunk under a lingering state of cachexia, and in those who have been carried off by more acute affections.

Although the accumulation of blood by congestion is strikingly influenced by the depending position of parts, yet, as Billard has justly remarked that the parts reddened by inflammation are found variously circumstanced with refe-

On the situation of injection.

rence to position, it may and does occur that the depending and congested convolutions have also been in a state of inflammation.

Distended
veins.

For the same reason, the turgid condition of the veins leading from the part, which may be considered as good evidence of congestion, is liable to some fallacy: it may happen that this state may be found in connection with inflamed parts, seeing that congestion and inflammation may be combined.

Thickened
membrane.

It seems scarcely possible that redness and injection, whether from inflammation or congestion, should be entirely unaccompanied by thickening of the membrane: yet I can quite agree with Billard, that this thickening may be slight and little apparent, and only dependent on the state of vessels. But I am inclined to think, that where this injection is very considerable, so that all the coats are affected by it, and blood-vessels of considerable size distended, the state of the blood in these vessels, as well as the character of the effusion into the cellular structure, will be likely to afford us the means of distinction between the two states. After a high degree of inflammation, capable of producing the great injection here alluded to, the vessels will be found to contain coagula more or less adherent to their internal surfaces. The effusion into the tissues also participates in the tendency to coagulation. These appearances do not exist to the same extent, and with the same character, in mere congestion, however considerable.

State of the
secretion.

The state of the secretion upon the suspected part, though it may throw great light on the existence of inflammation, does not, in all cases, afford conclusive evidence; seeing that where the secretion from the membrane generally is very abundant, the state of secretion at the inflamed part may be masked, and modified, by that derived from other parts.

The inflammatory redness of the mucous membrane of the small intestines is not only met with in the two forms which I have already noticed; namely, deep extensive and

general injection, producing an appearance which might be compared to that of a piece of red cloth or velvet, and that in which the redness is more particularly confined to the edges of the *valvulae conniventes*: we also meet with inflammatory redness in a diffused form, but occupying limited portions of the intestine, and of much less intensity than in the case first alluded to: it is in such cases that the previous existence of inflammation is most equivocal. Sometimes the redness occurs in small spots, which, on close examination, are seen to be produced by the superior injection and turgescence of small vessels. The remark which I offered, when speaking of the dendritic injection of the mucous membrane of the stomach, applies to this appearance also. In consequence of the feeble support which the vessels receive from the tender structure through which they ramify, they become considerably but irregularly dilated under the influence of inflammation, and want the clean defined outline which we see in most healthy tissues when merely injected. This yielding of the minute vessels to the distension accompanying the injection not merely produces the irregularity and want of well-defined outline of which I have just spoken: it also occasions a somewhat spotted appearance, in consequence of this distension being more considerable at some points than over the inflamed membrane generally. These spots of particularly intense redness, which in their character seem very analogous to the spots of deepest redness which we have had occasion to notice when speaking of the recently and acutely inflamed serous membrane just before the false membrane becomes organized, are probably not solely produced by the superior distension of the injected vessels, since it is highly probable that there may also be a greater number of vessels injected with red blood.

Partial, diffused redness.

In the mucous membrane there is another cause for inflammatory redness, occurring in spots which we do not meet with in the case of the serous membranes. I allude to the glandular appendages to the mucous membrane.

Partial red-
ness influ-
enced by
glands.

Although I am not now going to take up the subject of the derangements of these glands, it is necessary that I should notice them here, as not only connected with, but, as it would appear, as the cause of the redness in spots which we occasionally meet with in the mucous membrane of the small intestines. When the state of the solitary glands has excited irritation in the mucous membrane in which they are scattered, an areola of increased vascularity is produced around each, which is often much more conspicuous than the gland itself, insomuch that it may not always be easy to determine whether the spots of increased redness depend on these appendages, or are of the kind which I previously mentioned: yet I think, that when dependent on the solitary glands, the spots are not quite so numerous and thickly placed, but are more distant and considerable than when of the other description. In other cases, the glands are so apparent, as to leave no room for doubt as to the nature of the vascular spots around them. On the subsiding of the irritation, the injected vessels sometimes continue apparent, but of a dark greyish colour; but this appearance is much less common in the small than in the large intestines.

Ulceration of
the mucous
membrane.

The inflammation of the mucous membrane of that part of the intestinal canal on which we are now engaged sometimes proceeds to the state of ulceration. In examining the ulcers in this part, it is not always easy to decide whether they essentially belong to the mucous membrane itself; or do not rather belong to the glandular apparatus, having commenced in them, and merely affected the mucous membrane by extension of the derangement.—I wish you to be aware of this difficulty; which will prevent my drawing in theory a more defined line than will be found to exist, on actual inspection, between the ulceration, dependent on difference of texture in the small intestines. Yet, as we do find ulceration in the small intestines essentially dependent on the mucous membrane, I shall commence by that form.

I have already noticed that form of inflammation of the

lining membrane of the small intestines which is characterized by suppressed secretion, by increased redness of the edges of the valvulæ conniventes, and by adhesion of fœcal matter, or inspissated secretions to those edges. This form of inflammation sometimes proceeds to a state of ulceration. On detaching the adherent material, we find an appearance of abrasion of the membrane immediately beneath it. Ulceration of the membrane may also be produced by strangulation, and by other causes affecting the intestine from without.

* Since this Lecture was written, I have had the advantage and pleasure of becoming acquainted with Dr. Boehm, of Berlin; to whose valuable researches respecting the glandular appendages of the mucous membranes of the intestinal canal I shall hereafter have occasion to allude. From that gentleman's personal communications, as well as from his valuable Memoir, I have learnt, that he has known inflammation of the mucous membrane of the small intestines produce such a degree of softening of the texture, that the villi have become extensively detached, and contributed to give turbidity to the increased secretion. This phænomenon formed one of the most remarkable pathological alterations which he observed to take place in the epidemic cholera.

For this discovery he was indebted to the help of the microscope; an instrument which—improved, as it has been of late years, through the labours of my friend, Joseph J. J. Lister, and others—may be considered as having opened a new field for physiological and pathological investigation.

LECTURE XXI.

ON THE MUCOUS MEMBRANES.

MUCIPAROUS GLANDS OF THE SMALL INTESTINE—PARASITICAL ANIMALS—WOUNDS.

TWO SETS OF GLANDS (OR RATHER FOUR, SEE NOTE), THE GLANDS OF PEYER, AND THOSE OF BRUNNER—OF THE SOLITARY GLANDS—THEIR HEALTHY STATE—SMALL—DISCOLOURED, MUCH ELONGATED—ACUTE INFLAMMATION—UNDER TWO FORMS—CONJECTURE RESPECTING THEM—DOUBT RESPECTING THE OPINION OF PROFESSOR LOUIS—INFLAMMATION CAUSED BY EPIDEMIC INFLUENCES—APPEARANCE LIKE THAT OF VARIOLOUS PUSTULES—ULCERATION—CONSEQUENT PERFORATION OF INTESTINE—STATE OF ADJOINING STRUCTURES AND EXTENSION OF ULCERS—CHRONIC INFLAMMATION AND TUBERCULOUS DEPOSIT—OPINION OF PROFESSOR LOUIS—MALIGNANT DISEASE—OF THE AGGREGATE GLANDS—HEALTHY STATE—NOT UNIFORMLY CONSPICUOUS—DEFICIENCY IN NUMBER—EXTENT—DEVELOPMENT—EXCESS—VARIETIES IN SURFACE—IN COLOUR—OF THE APPEARANCES PRODUCED BY INFLAMMATION IN THE AGGREGATE GLANDS—ACUTE INFLAMMATION OF TWO FORMS—FIRST FORM—TRANSLUCENT INFLAMMATORY TURGES-CENCE—SECOND FORM—PROBABLE SHARE OF PREVIOUS CHRONIC ENLARGEMENT—ULCERATION—CAUSING PERFORATION OF THE INTESTINE—ATTENDED BY SLOUGHING AND HÆMORRHAGE—MODE OF GRANULATION—MODE OF CICATRIZATION—CORRUGATION OF THE VALVULÆ CONNIVENTES—EXTENSION OF ULCERS—SPHACELUS EXTENDING BEYOND THE GLANDS—CHRONIC AFFECTIONS OF THE AGGREGATE GLANDS—TUBERCULOUS DEPOSIT—CONSEQUENT ULCERATION—CARUNCULOUS EDGES—TUBERCULOUS MATTER IN THE LACTEALS AND MESENTERIC GLANDS—MALIGNANT DISEASE—PARASITICAL ANIMALS IN THE SMALL INTESTINES—WOUNDS OF INTESTINES—ESCAPE OF THEIR ORDINARY CONTENTS—ESCAPE OF PARASITICAL ANIMALS—ADHESION OF THE WOUNDED PARTS—CAUSE BY WHICH IT IS FAVOURED—REPARATION OF LOST SUBSTANCE—NOTE RESPECTING THE LENGTH OF THE INTESTINAL CANAL.

GENTLEMEN—

Two sets of glands (or rather four. See note.)

IT is well known, that in the portion of the intestines on which we are still engaged there are two orders of glands—the solitary, of which I have had occasion to speak, in treating of the duodenum; and the aggregate, which are generally few and small in the higher portion of the small intestine, but become increasingly large and numerous

towards the termination of the ileum, where they merit special attention.*

* When this Lecture was delivered, our knowledge of the glandular appendages of the intestinal mucous membrane had not been enriched by the laborious researches of Dr. Boehm, and much accurate observation and discrimination of the older anatomists had been suffered to remain almost unnoticed. The writings of the most laborious and esteemed recent investigators of the pathological anatomy of the intestinal canal have consequently exhibited a want of precision; which is greatly to be regretted, as diminishing the value of their otherwise important productions. In this deficiency I must confess that I have myself participated; but as I trust that neither the accuracy of the observations which I have recorded, nor the conclusions which I have drawn from them, are vitiated by this circumstance, I have not thought it necessary to cancel what I had written. I have merely, in some instances, altered the term 'follicle,' when speaking of the solitary glands: and I must likewise correct the statement, that there are but two sets of glands to the mucous membrane of the small intestines. Boehm, who has recalled the attention of anatomists to the precise and accurate observations of Peyer, Brunner, and Lieberkühn—and who has united and extended them by his own patient investigations, aided by the superior microscopes produced by Sheik, in Berlin—has established the existence of four different kinds of glands in the small intestines. He separates the glands of Brunner, which by their presence distinguish the first part of the duodenum from the solitary glands, which are met with in every other portion of the small intestines. He has shewn that the glands of Brunner, notwithstanding their small size, may be regarded as of the conglomerate kind. The small scattered bodies to which he appropriates the term of 'solitary glands' also possess forms more complicated than that of simple follicles; and bear some analogy, in their anatomical structure, to the patches of Peyerian glands, with which they are so often associated in the alterations consequent on disease. He mentions a third set of solitary appendages, which, though described by Lieberkühn, whose name they bear, appear to have remained unnoticed, as well as unmentioned. The fourth set consists of the Peyerian glands of which Dr. Boehm has given an elaborate description. I am unwilling to introduce his description into these pages; as I have not yet had leisure and opportunity to make that personal repetition of his examinations which I regard as an essential preparation for the production of a graphic and accurate account of these structures. I must therefore refer the English reader to the British and Foreign Medical Quarterly Review, in which the results of Dr. Boehm's researches are detailed. They may also be found in my friend S. Solly's valuable

The glands
of Peyer, and
those of
Brunner.

Both of these sets of glands were, for the first time, well described by Peyer; who, when he was a young man, called the attention of anatomists to these structures. He gave the most minute and particular attention to the patches of aggregate glands which have ever since borne his name. Some twenty or thirty years after, Brunner still further took up the subject of the solitary glands; and, as I have already stated, gave particular attention to numerous glands of this description which occur in the duodenum. The solitary glands have, consequently, borne the name of Brunner, in contra-distinction to the aggregate glands of Peyer. Although these glands are frequently found affected together, and, as it would appear, by the operation of the same causes, I shall, in consequence of their different appearance, take them up separately, and commence with the solitary.

OF THE SOLITARY GLANDS.

In a healthy
state, the
solitary
glands very
small.

The number of these glands very sensibly decreases after we have passed the upper part of the duodenum; but, although their frequency may somewhat differ in the subsequent parts of the small intestine, I am not aware that this difference exists to a degree to attract special attention. In the healthy state, these glands are often so small as to elude our search. In other cases, they are sometimes sufficiently large to be visible and distinct, but without our having any reason to suspect their being actually in a morbid

valuable translation of Professor Müller's Observations on Glandular Structures. The subject of the glands of the intestinal canal have also been ably treated by Professor Albers, of Bonn; whose oral communications on the subject, as well as other kind personal attentions, I am bound gratefully to acknowledge. In his "*Beobachtungen auf dem Gebiete der Pathologie und Pathologischen Anatomie*," he has not only republished the anatomical distinctions established by Dr. Boehm, but has added many valuable and interesting details respecting the pathological condition of those bodies: and I am gratified to observe the general correspondence, between his observations and those which I had previously made and recorded.

condition. I think that I have observed this conspicuous size, in the healthy state, much more remarkable in children than in adults; and I find this conclusion supported by the cases observed by Billard and others. Under disease, these glands are apt to become more considerably enlarged, and to be the seat of derangements of structure which claim particular attention. The simple hypertrophy of these glands, which is sometimes conspicuous in children, is, I apprehend, connected with loco-phlegmatic constitution, and a tendency to struma. It is therefore probable that such enlargement, though short of actual disease, may occasion a predisposition to such a state. The solitary glands, which frequently elude our research, may sometimes be rendered visible by short maceration in water; which seems to distend them, by combining with the mucus which is retained in the follicles. These glands are sprinkled over the internal surface of the intestine, without exhibiting any thing like a precise or regular arrangement: sometimes two or three glandules are near together; but they are more often altogether single, and appear to be placed pretty equidistantly from each other. They occur indifferently in all parts of the circumference, as well near the mesentery as on the opposite side. They are found upon the sides and summits of the valvulæ conniventes, as well as in the spaces between them. They often exhibit no distinction of colour by which their situation and existence may arrest attention; but they not unfrequently present at their centres a small opaque black or grey spot, which gives them, in some degree, the appearance of the sebaceous follicles of the skin when they produce acne punctata. In one or two instances I have seen the internal surface of the small intestines sprinkled with small yellowish-brown spots, which, from their number, size, and situation, I conceived to depend on the solitary glands; yet these bodies were, excepting in this one respect, very little perceptible. From the colour, size, and irregular figure of these spots, their combined appearance suggested a resem-

discoloured;

blance to the appearance which would be produced by thinly sprinkling the internal surface of the intestine with coarse brown snuff. I have already had occasion to notice this appearance, as analogous to that which is sometimes met with in the stomach, and which favours the idea of the mucous membrane of the stomach possessing follicles: the spots in the small intestine of which I am speaking were, in the case which I have now in view, much smaller than the generality of those in the stomach.

When the solitary glands are rendered particularly conspicuous by extraordinary development, this is not always occasioned by distension from retained secretion, but on an increase in the substance of the gland itself, or by a slight thickening of the immediately surrounding texture. In a specimen of small intestine removed, by my friend T. W. King, from a lad in whom the development of one kidney had been suppressed, and in whom the other kidney had been recently affected with acute inflammation, the solitary glands were very remarkably enlarged, in a mode which I do not remember to have particularly noticed before, and which I do not think has been distinctly pointed out. In the situation of the solitary glands, small elevations were observed, without any appearance of disease in the intervening mucous membrane. The size of these glands might equal that of a grain of millet; but many of these elevations were somewhat elongated. These elevations, on close inspection, appeared to consist of little else than mucous membrane. They were covered with villi, in every respect resembling those of the intervening mucous membrane. The follicular opening itself could not be perceived, and nothing like the presence of a small glandular body was discoverable by the touch; at least such was the case after the specimen examined had for some time been soaked in water and spirit: in fact, the character of these projections might be described as appearing to consist of mucous membrane partially extended by a blunt pin, or some similar

enlarged ;

much elongated.

body, pushed beneath it: hence, in structure, they bore a resemblance to the *valvulæ conniventes* themselves, though widely differing from them both in size and figure. Although the follicles themselves eluded detection, it cannot, I conceive, be doubted that these projections really depended upon glands, and marked their situation; and I conceive that they may have been formed in the following manner:—A temporary turgescence may have rendered the glands somewhat prominent and firm; and when in this state, the peristaltic movement of the intestine, and the passage of alimentary matter through it, may have had the effect of drawing them forward, under a covering of mucous membrane. The size and number of the *valvulæ conniventes*, which were particularly striking in this case, seem to indicate an abundance and laxity of mucous membrane which would render the supposed process the more probable*.

I have stated, that the solitary glands of the small intestines are liable to present a certain range of development, independently of disease. I have now to speak of those preternatural appearances which depend on an increase of size from a morbid action. The solitary glands of the small intestines may be rendered morbidly prominent, as the result either of acute or chronic irritation.

In the first place, I shall speak of the acute form. It would seem that this may exist under two varieties: the one attended with a considerable increase of vascularity; the other, in which the injection is inconsiderable, and the general colour scarcely exceeding a pale rose blush. In speaking of the general inflammation of the mucous membrane, I took occasion to notice the fact, that we sometimes find this injection most considerable at particular points, and

Acute inflammation,

under two forms.

* I have since seen a specimen, taken from a patient who died in St. Thomas's Hospital, in which this peculiar enlargement of the solitary glands was still more remarkable. In many instances, they produced a kind of papilliform elongation, half-an-inch or more in length, and in thickness equalling a common probe.

that the mucous glands appear to be the centre of these irritated spots. This is sometimes the case when the morbid increase of the size of the gland is very inconsiderable. In the other form, the injection is inconsiderable; and the alteration of colour so slight, that, in some instances, it might pass unnoticed. The increase in the size of the gland is much more remarkable than in the preceding cases. The best idea of them is, perhaps, that which is conveyed by comparing them to the *Glandulæ Pacchioni*, which they resemble in their rounded figure and imperfectly translucent texture. Although, at times, they may have a faintly pinkish tinge, they are not unfrequently even paler than the neighbouring mucous membrane, although this may be little altered in colour. Louis has particularly mentioned this, in one of his early papers. It is also this form which very frequently occurred in cases of cholera; and I think it by no means improbable that the absence of injection was the cause that this characteristic affection of the glandular apparatus was so long neglected, in the details of the morbid appearances connected with that formidable malady.

Conjecture
respecting
them.

It would be desirable to point out the circumstances under which these two forms of acute derangement of the solitary glands are met with: but the morbid appearances of the alimentary canal have, till within, comparatively, very few years, been either overlooked, or so vaguely and indistinctly described as to render it impossible to draw any certain conclusions from most of the recorded cases. Very little can be gleaned, even from the numerous cases observed and recorded by that laborious and generally accurate investigator, Morgagni. It is therefore only as a conjecture, that I offer the following opinion; which observation, rather than theory, has led me to form. I believe that where secretion has been very copious, the minute vessels are not only relieved from very considerable injection with red blood, but that the neighbouring soft structure, through

which these minute vessels ramify, becomes infiltrated with a serous fluid, nearly or quite colourless. It appears to me to be perfectly accordant with this view, that where a copious watery secretion has been poured out upon the lining membrane of the alimentary canal, the glandular apparatus should exhibit the turgid translucid character to which I have been referring. The œdema in the neighbourhood of inflamed parts, and more especially certain cases of quickly fatal laryngitis, appear to be analogous to the state of the glands which we are now considering. The other state, in which the solitary glands become the focus of spots of particular injection, may be accounted for in two ways. We have minute and intense injection; where irritation being considerable, secretion has been either suspended, or has only taken place to a trifling amount, being an analogy to what we see in some cases of cynanche: or congestion, taking place either before or after death, may have distended the relaxed vessels of the affected part.

It is, I believe, the opinion of Louis, that the solitary as well as the aggregate glands of the small intestines are seldom, if ever, found affected with acute inflammation, except in conjunction with two particular forms of disease; viz. cholera, to which I have already alluded, and common continued fever; or rather, that particular form of it to which Louis has given the name of ‘typhoid affection.’ I confess that it is not without hesitation, and some degree of misgiving, that I venture to differ from so patient and accurate an investigator as Professor Louis: nevertheless, I believe that it will be found that these glands are deranged under other circumstances besides those in which Louis has so constantly found them affected.

Doubt respecting the opinion of Professor Louis.

Although we cannot account for the epidemic influences which at different times render the derangements of different parts of the system more or less prevalent, the fact is sufficiently notorious: sometimes it is the conjunctiva which is thus prevalently deranged: at another time, the

Inflammation caused by epidemic influences.

Schneiderian membrane, with extension to the lining membrane of other parts of the air-passages, producing epidemic catarrh, or influenza: sometimes it is the tonsil glands and neighbouring parts of the fauces; and cynanche is then the prevailing malady: at other times, it is the small intestines which are affected; and the glands, with which we are now concerned, in common with the aggregate glands, appear to be the principal seat of derangement. This seems to have been particularly the case with the epidemic which occurred at Göttingen, and of which a valuable history has been left by Rhoderer and Wagler. This epidemic appears to have been a mucous, rather than a typhoid fever.

Appearance
like that of
variola
pustules.

The solitary glands, when enlarged by disease, have been observed to assume very much the appearance of small-pox pustules. This resemblance has been pointed out by Hewson, Le Cat, and Ouverard; and more recently by Dr. Hewitt, who observed this appearance, as well as ulceration in connection with fever. This resemblance to small-pox pustules has sometimes been so complete, as actually to occasion a belief in the existence of small-pox pustules in the alimentary canal, especially when this appearance has occurred in cases of small-pox. A more minute acquaintance with morbid anatomy has almost exploded this idea; and the existence of real small-pox pustules, to more than a very short distance below the fauces, is, I believe, admitted by very few: yet I must not omit to state, that Dr. Todd Thompson, though perfectly aware of the appearances which might lead into error in this respect, is persuaded that, in one or two instances, he has seen genuine small-pox pustules in the intestinal canal*.

Acute inflammation of the solitary glands is apt to proceed to a state of ulceration; and the ulcers so produced are

* A Memoir, tending to the same conclusion, and uniting erudition with careful observation, has been published by Dr. Froreip, of Berlin; and, if it does not wholly remove doubts on the subject, it at least increases the difficulty of denying the existence of these pustules.

generally small, and of a rounded figure. It is probable that, in some instances, this ulceration commences at a follicular opening; and spreading laterally, occasions the destruction of the surrounding mucous membrane; and produces an ulcer which may equal in size a silver-penny or a sixpence, though this is seldom the case. The edges of such ulcers are sometimes sharp, and little elevated: at other times, they are thickened, more especially if the ulcer be not very recent, and an attempt at reparation has taken place. These ulcers have sometimes laid bare the contractile fibrous or peritoneal coat, and have even perforated the latter. When this has been the case, the opening through the mucous coat is the largest, and that through the peritoneal the smallest; thus exhibiting the clearest analogy to perforations of the stomach and of the pylori-valvular portion of the duodenum, when proceeding from within to without. Several authors, who have carefully described the morbid appearances met with in cases of fever, have noticed these ulcerated perforations of the small intestine. I may particularly mention, Andral, Louis, Dr. Hewitt, and Dr. Bright.

Consequent
perforation
of intestine.

The ulcers of the small intestines connected with the solitary glands do not always appear to spread from the follicular aperture, but to depend on the sloughing of the subjacent structure. In the same case we may meet with the process in different stages: in some, the follicle merely presents a slight elevation: in others, it forms a well-defined prominence, of larger extent, though still but slightly elevated. If we conceive a split pea or a lupin-seed placed beneath the mucous membrane, we may have a pretty correct idea of the size and form of these elevations. The mucous membrane covering them may still retain its ordinary paleness. I have observed this fact myself, and the same thing has been noticed by Dr. Hewitt. In other spots, the mucous membrane is wanting; and a slough is exposed, which not unfrequently presents an ochre-yellow colour, being stained by the bilious matter which had passed

State of
adjoining
structures, &
extension of
ulcers.

over it: the degree of adhesion or separation of this slough will, of course, admit of much variety; and on its detachment, an ulcer of greater or less depth must be the consequence. The ulcers formed in this way are, of course, larger than the generality of those produced by extension from the follicular aperture, and they may, at times, present a greater depth; but when those which I have first mentioned are far advanced, their appearance, as well as their result, must be nearly the same.

It is pretty obvious that the circular elevations which ultimately give rise to sloughing and ulceration cannot simply depend on enlargement of the glandular structure and obstruction of its secretion: there must be a deposit in the submucous cellular membrane, which the diseased gland has in some way determined. The appearance of the elevation, as well as slough, when exposed, tend to confirm this opinion. A query must then be raised, whether, in such cases, the derangement of the solitary glands, the thickening and ulceration of the surrounding texture, the ulceration of the superjacent mucous membrane, and the detachment of the slough, are all to be ascribed to the acute attack and strongly-marked febrile disturbance which, in most instances, have characterized the malady by which the patient has been carried off; or whether there has not rather been a chronic affection of these glands, the symptoms of which were little apparent, and that acute disease did not commence till ulceration had taken place. This is a question on which I may speculate, but which I confess I am unable to decide.

Chronic inflammation,
and tuberculous deposit.

The solitary mucous glands are also liable to chronic enlargement and ulceration; which appear to be the result of tuberculous deposit, either in the gland itself, or in the immediately surrounding cellular membrane. The softening of this tuberculous matter leads to ulceration through the mucous membrane. This process is very similar to that by which tubercles in the lungs communicate with the bron-

chial tubes. The ulcers in the small intestines, thus produced, have little or no disposition to heal: their edges are sometimes pale, and little elevated: at other times they are thickened, with or without discolouration. I believe those with elevated edges to be of the longer standing.—Ulcers similar to those which I have just described, may, I conceive, be the result of tuberculous deposit in the cellular membrane, between the coats of the intestine, independently of the glandular apparatus. From the indistinctness which frequently attends this apparatus, it is not easy to be certain of this fact when the deposit is situated immediately beneath the mucous membrane; but there can be no doubt of it when the deposit takes place between the contractile fibrous coat and the peritoneum. Ulcerations of the small intestines, the consequence of tubercular deposit, are the very frequent concomitants of tubercular phthisis; and it is strongly insisted upon by Professor Louis, that they never occur without the co-existence of tubercles in the lungs. His observations on this head have been so numerous and so minute, as sufficiently to establish the general rule; though I conceive that they do not exclude the possibility of an exception; nor must this coincidence, however constant, be allowed to lead to the belief that the pulmonary affection is always primary, and the intestinal ulceration always secondary to it. I have repeatedly had occasion to witness chronic ulceration of the intestines, which appeared to depend upon tubercular deposit connected with the glandular apparatus, existing to a great extent, and evidently of long standing, when the pulmonary tubercles were very few, and perhaps evidently recent. I believe that such ulcerations of the intestine occur in persons of strumous constitution, in conjunction with various local affections commonly taking place in such constitutions, and which are liable to bring on hectic fever, emaciation, and disturbance of the bowels. I allude to such scrofulous affections as those of the knee and ankle-joints, lumbar abscess, and the like.

Opinion of
Professor
Louis.

I cannot say that tubercular ulceration of the small intestines is never a primary affection, but I do not call to mind a case in which it has been so. Tubercular ulceration, like the more acute form of ulceration, at times produces perforation of the intestine; but the gluing together of the convolutions, which generally accompanies such an affection, renders the escape of fœcal matter very uncommon and improbable*.

Malignant
disease.

The solitary glands are very rarely affected by malignant disease. Should they be so, it is highly probable that the aggregate glands would be associated with them in the derangement; and I believe this to have been the case in the example to which I shall allude in speaking of the latter glands.

OF THE AGGREGATE GLANDS.

These glands are sometimes called the glands of Peyer, from their discoverer or first accurate describer. They are also called the elliptical patches, from their form. “*Placques elliptiques*” and “*placques de Peyer*” are the terms by which they are distinguished by the French pathologists. Although in the causes and appearances of their derangements they have a close analogy with the solitary glands, yet I have thought it right to speak of them separately; not only on account of their peculiarities of structure, but because, of late years, particular interest and importance has been attached to them. They are most numerous towards the termination of the ileum; but they may be seen throughout the greater part of the small intestines, although it is very

* Tuberculous ulcers in the small intestines are not always numerous. They may be nearly or quite solitary. I have seen near the middle of the ileum a single deep and evidently old ulcer with a circular elevated edge, and the included surface of a livid colour and firm texture, in a phthisical subject in which there were also numerous, recent small ulcers, accompanied by small tuberculous deposits. I am informed, by my friend Dr. Seth Thompson, that similar cases are often met with in the large hospital in Vienna.

rare for them to be conspicuous in the upper portion of the canal. There is a great variety in their visibility, even in healthy intestines. I have known it very difficult to detect the traces of a single gland of this description. This occasional difficulty has even induced a suspicion that the elliptical patches are not a natural and glandular apparatus, but the result of a morbid action;—that they are, in fact, the traces of subsided inflammation or ulceration. I need scarcely inform you, that I in no degree participate in this opinion. In the healthy state, they are more distinct in children and infants than in adults; and in many cases there has been no probability of their conspicuous development being connected with disease. Comparative anatomy furnishes a further proof, that the aggregate glands constitute natural and distinct organs. These glands differ much in size: they are frequently not so large as a small almond, whilst in other cases they exceed an inch or two in length. I once saw an instance, in the intestine of a little girl about eight years of age, in which a patch of aggregate glands could not be much less than seven inches in length. When these glands are of large size and considerably developed, they can scarcely escape observation, even when no particular pains are taken to detect them. When, from their little development, there is a difficulty in discovering them, the best plan is to have the mucous surface gently washed or sponged: they may then be held between the eye and the light, when a slight difference in colour or transparency will generally render the situation of the glandular structure evident. If the intestine be laid upon a flat surface and viewed rather obliquely, the site of the glands may be seen and distinguished, in consequence of the peculiar character of the surface. The *valvulæ conniventes* are, I believe, never seen to encroach on these patches, but generally terminate as they reach their border, having gradually diminished in size as they approached them. The difficulty of detecting them is greatest

These glands
not uniform-
ly conspi-
cuous.

Healthy
state.

in those wasted and attenuated intestines in which the valvulæ conniventes are scarcely perceptible, and in which there is little difference to be seen between the surface of the gland and that of other parts of the intestine. These glands are found in that part of the calibre of the intestine which is most remote from the mesentery. They generally occur in patches, at intervals of a few inches from each other; but they are by no means equi-distant. They are more closely placed in the inferior than in the superior part of the intestine, and in some instances they are seen almost to touch each other.

Besides the principal elliptical patches, we may not unfrequently see between them patches of much smaller size, and generally of a rounder figure, but possessing, to all appearance, the same structural characters. The aggregate glands appear to be made up of numerous subordinate follicles; but they must not be regarded as merely a collection of the solitary glands, such as I have formerly described, seeing that they are so combined as to constitute an individual organ, and not a mere cluster of individuals. In some parts of the intestinal canal, a few solitary glands may be seen clustered together; but this collection does not constitute a genuine patch of the kind with which we are now engaged. The solitary glands, when collected in the manner to which I have now alluded, have been called agmenated; but this term, both in sound and etymology, bears too great a resemblance to that which is given to the elliptical patches to make it appear a very good distinctive name. The subordinate follicles, of which the patches of aggregate glands are made up, are in the closest juxtaposition and mutual dependence on each other; and exhibit a trace of arrangement in which the indistinct lines which they form are placed more or less transversely to the course of the intestine, and, consequently, to the greater diameter of the patch. There is a more distinct border or margin to the patches of aggregate glands than is consistent

with the idea of their being a mere collection of solitary follicles. These patches may, therefore, not inaptly be compared to compound flowers, in which, within a single calyx, there are numerous florets, which, though perfect in themselves, cannot be taken as individual flowers; or, as I have before hinted, they may be compared to the amygdalæ or tonsil glands, to which they appear to me to bear the same relation which the solitary glands do to the follicles and smaller glands in the fauces. I shall revert to this analogy, when I have noticed the derangements to which the aggregate glands are liable.

I am not prepared to say whether there is really any great variety in the number of the Peyerian glands in different individuals, or whether their apparent deficiency in some individuals, and their striking size and number in others, is merely to be ascribed to a difference of development; but I am inclined to believe that both modes of explanation must be admitted. There is unquestionably a difference, as respects the extent of patches, in different individuals: it is therefore probable that we may have deviations from the normal state of these glands, consisting of deficiency in three forms; namely, in number, in size, as respects extent of surface, and in development, as respects thickness and peculiarity of surface. I do not know that deficiency, in any of these forms, ever possesses any decided pathological importance; but the last-mentioned form is interesting, as respects the character of these glands in health and disease. Their deviation from the normal state, on the side of excess, is much more remarkable and interesting. I have already noticed their unusual extent, amounting, in one instance, to six or seven inches. Billard has noticed them as having an extent of three or four inches. I have repeatedly seen them remarkable for their thickness, and irregular and characteristic surface, where there did not appear to be any reason to connect such development with any deviation from health; as, for

Deficiency
in number,
extent, de-
velopment.

Excess.

example, where the individual has been carried off by accidental death, or by a disease of a distinct and independent character. I may mention the testimony of Billard, in confirmation of my own, on this point: the fact, that the cases referred to occurred in young persons, supports the remark which I formerly offered. I am disposed to connect this preternatural development of the aggregate glands like that of the solitary; with which, perhaps, it invariably, or in most instances, concurs with leuco-phlegmatic or strumous constitutions.

Varieties in
surface:

There is considerable difference in the appearance presented by the surface of these patches: sometimes the minute depressions, which may be regarded as follicular orifices, are very apparent, and seem to possess a certain arrangement, to which I have alluded; whilst in many other instances this structure can only be seen by transmitted light, or by light falling in a particular direction. There is also considerable difference in the transparency of these patches: sometimes, in this respect, they scarcely perceptibly differ from the surrounding mucous membrane; whilst at other times they are much less transparent, presenting a sort of milky turbidity, in which the reticulated appearance produced by the follicular depressions and intervening elevations is sufficiently obvious. There is also

in colour.

a variety in the colour of these patches: they are often paler and more opaque than the surrounding mucous membrane. It not unfrequently happens, that amidst this general paleness there are numerous marks of a greyish colour, generally in the form of specks, and marking the follicular apertures, but sometimes in the form of irregularly-curved lines. The presence of these grey spots constitutes the most frequent deviation from the perfectly natural appearance of the aggregate glands: we find it without any perceptible alteration in thickness or texture, and in persons who before death had exhibited no symptoms of intestinal disease; yet, in some instances, the individual

has been known to have suffered from bowel irritation within some few months of his death : hence I am inclined to believe that these grey specks and streaks, like the grey colour in some other situations, is to be regarded as the result of subsided irritation. Louis thinks that in some cases this grey colour is to be regarded as the effect of age. I do not think this idea at all improbable ; but I believe that, in my experience, this appearance has been quite as common in young children as in the bodies of old persons. I have noticed these black spots on the patches of aggregate glands, in the inspection of persons who have been known to have laboured under febrile derangement, at a period not very remote from the time of their death. I was particularly struck with the unusual frequency as well as degree in which this appearance was met with, in persons dying of various affections, during several months which followed the prevalence of the epidemic cholera. A few of these persons had been known to have suffered from the epidemic ; others had had bowel derangement, but to a degree which did not merit the appellation of cholera ; and in others it was not discovered that the patients had laboured under any notable disturbance of the bowels : and I strongly suspected that the appearance was as much or more connected with the more general and very depressing epidemic, the influenza, which prevailed about the same time.

OF THE APPEARANCES PRODUCED BY INFLAMMATION IN
THE AGGREGATE GLANDS.

These appearances bear the closest analogy to those which we have already noticed, in speaking of the solitary glands : they are almost constantly found associated with them ; and almost every thing which I have said respecting them will apply to the affections of the aggregate glands, though the greater extent of these bodies, and the peculiarity of their structure, will call for some additional remarks.

Acute inflammation
of two forms.

First form.

We find the aggregate glands deranged both by acute and chronic inflammation; and of the acute we find two principal forms. In making this latter division, I am glad to find, that, without having copied from Louis, I am quite in accordance with him. In the first of the acute forms of inflammation we find the thickness of the patches of aggregate glands comparatively little increased: they are reddened by minute and more or less intense injection, in which the surrounding mucous membrane frequently participates. Instead of an increase, there is often a striking diminution of secretion; and fœcal matter or inspissated mucus often adheres to the surface of the patches, as well as to the edges of the neighbouring valvulæ conniventes, an effect with which the accumulation of air at the part affected appears to be closely connected, and perhaps, in some degree, in the relation of a cause. Although the patch of aggregate glands in this state does not appear to be ulcerated, abrasion is very easily produced when an attempt is made to remove the inspissated secretion. The inflammation of the aggregate glands, unattended with remarkable thickening, and perhaps without any particular difference in colour to distinguish it from the surrounding mucous membrane, is much more likely to escape observation than the second form, in which the thickening is considerable: it is, however, by far the more frequent form, at least in this city. This fact may perhaps account for the affection of the aggregate glands in conjunction with fever, having been less frequently noticed by our own pathologists than by those of foreign schools, who appear more frequently to have met with very considerable derangements of these glands accompanied with thickening. In cases of fever, to which the experience and views of the Pathologists to whom I have alluded have induced me particularly to look for derangements of the aggregate glands, the deviation from the healthy state has been so slight, that unless thus directed to it, it might have been overlooked, and atten-

tion engrossed by some more manifest and extensive lesion of other organs, more especially of the lungs, and sometimes of the brain. In some persons who have been carried off some weeks after an attack of fever, I have seen traces of the subsided inflammation of these glands, but without any appearance of abrasion or ulceration having taken place: there has been little or no increase of thickness, but the surface of the patch has appeared a little contracted and corrugated, rather more harsh to the touch than the surrounding mucous membrane, and somewhat discoloured, either by sanguineous injection or grey points. I do not wish it to be inferred, from what I have now said, that the inflammation of the aggregate glands, of the kind which I have just been describing as characterized by little increase of thickness, is not susceptible of ulceration; but I think it to be strikingly less so than the opposite form, in which the thickening is considerable.

Before I speak of the opposite form, which is characterized by great thickening of the patches of aggregate glands, I must notice another form, which also has its analogy in one of the forms of derangement of the solitary glands which I have already described; namely, that in which the glandules themselves seemed turgid and translucent from serous infiltration, and of a paler colour than the surrounding membrane. This form of derangement in the aggregate glands is also marked by a translucent turgescence, of a light pinkish colour, as pale or paler than the surrounding membrane. Though the thickness of the gland is increased, it is not very considerably so, and appears to be independent of alteration in the subjacent mucous membrane. The follicular openings and intervening elevations are pretty strongly marked; so that the natural reticulated irregularities of the surface of the gland are exaggerated. This form of derangement of the aggregate glands was a frequent occurrence amongst the morbid appearances met with in the dissection of cholera patients. It appears that ulceration

Translucent
inflamma-
tory turgescence.

sometimes takes place in connection with this form of inflammation. The fact has been particularly noticed by my friend Dr. Foville; and I shall revert to some observations which he has made respecting it, when I speak of the ulceration of these glands.

Second form.

In that form of inflammation of the patches of aggregate glands in which increase of thickness is most remarkable, amounting sometimes to the eighth of an inch, though generally less, the subjacent cellular membrane as well as the gland is concerned: it may therefore be referred to that form of derangement to which I have stated that the solitary glands are liable, and in which their size is much increased and their structure affected. We shall presently see that the nature and progress of their derangements are very similar. It generally happens that the lowest patches of aggregate glands are the furthest advanced in disease; and that as we proceed higher up in the intestine, we find other glands in which less progress has been made. In those which are least advanced, we find the glandular patch marked by a decided prominence, and its surface probably unaltered either in colour or form; or perhaps the natural inequalities may be a little exaggerated. In those which are further advanced, the thickening is more considerable, the surface is more strikingly uneven, and exhibits a character which has been compared to quilting: but if I were to choose a simile, I would compare the glands in the state which I am now describing to the oval cotyledons on the interior of the uterus of a cow, when the foetal part has been removed. The resemblance is very considerable as to figure and character, but in colour and size the comparison will not apply. It has been particularly and accurately remarked by Dr. Bright, in the First Volume of his Reports (but I do not find it mentioned in any other printed work), that the edges of these enlarged glands slightly overhang the surrounding mucous membrane, and even allow the handle of a scalpel to be past to a very short distance between them*. In those which are

* A similar remark is made by Professor Albers of Bonn.

still further advanced, the mucous membrane appears to be removed or discoloured; and when ulceration has taken place, I think it is apt to occupy a much larger portion of the inflamed surface than is commonly the case with the first-mentioned form: in fact, the edge excepted, the whole surface may sometimes be in this state. The surface exposed by this ulceration appears to consist of the thickened glandular structure and subjacent mucous membrane. This slough is frequently of an ochre-yellow colour, from the bile which has passed over it: sometimes it is of a dirty-olive colour, from the same cause. There is also a difference in the degree of its adherence to the subjacent structure: sometimes it is firmly adherent, and at other times separation is nearly or quite effected. Respecting the ulcer which is the necessary consequence of this process, I shall have occasion to speak particularly by and bye. With respect to the enlargement of the aggregate glands of the form with which we are now engaged, I feel there is precisely the same difficulty as that which I noticed in the case of the solitary glands when they are considerably enlarged by thickening of the surrounding structure; namely, it is difficult to decide how much of the change in question is due to the recent attack, and how much to a chronic enlargement which may have preceded it. Louis has mentioned a case of this kind, in which the glands were very prominent along the whole course of the small intestine, and patches of aggregate glands were observed almost throughout this tract. This case appears to favour the idea of a chronic enlargement pre-existing to the acute attack; since it is very commonly observed, that the inflammation of the aggregate glands first takes place very near the cæcum, and seldom advances far or rapidly above the extremity of the ileum: it seems, therefore, contrary to analogy to suppose that an acute affection had almost simultaneously affected all the aggregate glands. Although I am inclined to admit the occasional existence of this chronic enlargement as a prelude

Probable
share of pre-
vious chro-
nic enlarge-
ment;

to more acute disease, yet I am by no means disposed to doubt that the acute attack itself may be a cause of these structures becoming very considerably swollen. In both of these cases, the analogy which I have pointed out between these glands and the amygdalæ is strikingly maintained.

ULCERATION.

producing
perforation
of the intes-
tine,

Ulceration is the frequent, but by no means the constant result of inflammation of the aggregate glands. It exhibits considerable difference in its character, according to the form as well as the severity of the inflammation which led to it. When the inflammation has been of the kind which I first described, in which the glands are but little thickened, the ulceration is more often partial; but by its spreading, and also by its occurring in several spots, the greater part of the surface may become ulcerated. The ulceration is also liable to extend in depth, and effect the perforation of the intestine in a manner precisely similar to that which I described, when speaking of the solitary glands; and I am not prepared to say which of these two structures is the more frequent seat of this fatal affection: but I suspect that it is more frequently the case with the aggregate than with the solitary glands, since generally they are the more severely affected in those fevers in which perforations are liable to take place. In that form of inflammation in which the aggregate glands appear pale, turgid, and translucent, I believe that ulceration is not often met with, since it appears to be essentially a condition of recent and acute disease: nevertheless, there is no doubt but that it is accompanied with a tendency to ulceration; and I believe that most, if not all of the best investigators of the morbid appearances resulting from cholera, agree in describing the ulceration of these glands, the inflammation of which appears to be of the kind to which I am now alluding.

When ulceration takes place in a greatly thickened and inflamed patch, the greater part of the surface seems to be

at once affected; which is perhaps to be ascribed to such ulceration being generally accompanied by the sloughing of a considerable part of the subjacent structure. I have already alluded to this slough, which is often of a yellow or dirty-olive colour, from impregnation with bile and other contents of the intestine. The thickness of the slough may be increased by the same imbibition which affects its colour. I have known very profuse hæmorrhage from the bowels take place when this kind of ulceration had been going forward; and several cases related by Dr. Hewitt tend to shew that this is not an unfrequent coincidence. Such ulceration, however, often takes place without hæmorrhage; and I am not prepared to say that hæmorrhage does not equally attend the other forms of ulceration. Whether the ulceration has been attended with the separation of a slough or not, it seems probable, that after spreading and extending for a time, a process of healing commences; yet those cases in which this process has been best described, appear to have belonged to the two first-mentioned forms of ulceration. Two circumstances are particularly worthy of observation in this process. In the first place, the new granulations appear to take place from the margin of the ulcer, shewing a striking analogy between this ulceration of the mucous membrane and that of the common integuments. These granulations thicken the edge of the ulcer, as well as give them a red colour; and the enlargement of small vessels supplying them with blood, produces an appearance of increased vascularity around them, which is often visible, both on the mucous and peritoneal surfaces. A case of this kind is minutely described and beautifully delineated in Dr. Bright's First Volume of Reports.

attended by
sloughing
and hæmorrhage.

Mode of
granulation.

The ulcerated surface is not, however, wholly filled up by new matter furnished by granulations emanating from the edges of the ulcerated mucous membrane, but, as I have before remarked, there is another circumstance to be attended to: the ulcerated surface is also reduced by the

Mode of
cicatrizization.

Corrugation
of the val-
vulæ conni-
ventes.

contraction of its margin, and the bringing together of the surrounding unbroken mucous membrane—an effect which is greatly facilitated by the laxity of the sub-mucous cellular membrane. The most striking evidence of the drawing together of the neighbouring mucous membrane is seen in the effect which it produces on the *valvulæ conniventes*. They are drawn nearer to each other where they approach to the healed or healing ulcer; so that they lose their parallelism, and appear to radiate. I noticed this fact some years ago, in one or two solitary cases; and my friend Dr. Foville subsequently made the same observation with respect to the cicatrizing ulcers of the aggregate glands, in some cases of cholera, when that disease prevailed as an epidemic at Rouen. It was of course those cases only in which the patients survived the early symptoms of the disease, and were carried off by the secondary fever, which exhibited the appearance in question.

Extension of
ulcers.

When the ulceration of the internal surface of the small intestine has commenced in the glands of Peyer, it is not invariably confined to them, but may extend considerably beyond them, in every direction.

When ulcers of this kind are not fatal in the early stage, their healing produces thickening of the parietes, and contraction of the calibre of the intestines; the effect of which may obviously be of the most formidable and serious character.

CHRONIC AFFECTIONS OF THE AGGREGATE GLANDS.

Tuberculous
deposit.

The principal chronic affection of the aggregate glands is the deposition of tuberculous matter, which is one of the commonest accessories to pulmonary consumption. The tuberculous matter is deposited in small isolated spots irregularly dispersed within the circumference of the patch. However small these deposits may be, they are more frequently observed in the opaque than in the translucent state. When this deposit takes place in the aggregate

glands, it produces effects precisely similar to those which I have described in speaking of tubercular deposit in the solitary glands. The tubercular matter softens; the mucous membrane over it ulcerates, and is perforated; and an ill-conditioned ulcer, indisposed to cicatrize, is the consequence. It is worthy of remark, that, in form and size, the tuberculous ulceration of the aggregate glands more nearly resembles that of the solitary glands than is the case with the acute ulceration accompanying fever: this fact is owing to the tuberculous matter being deposited in small isolated tubercles, which are about the size of solitary glands enlarged by tuberculous deposit: each of these little tubercles, on softening, produces an independent ulcer; hence, we may have several isolated ulcers on one gland of Peyer. As these ulcers spread, they may unite, and form a considerable extent of ulcerated surface. When these ulcers have been of long standing, their edges become irregular, and thickened by the abortive efforts at cicatrization. In some cases, the edges of the ulcers appear caruncular, from this cause. The surface within the circumference of these chronic ulcers, though depressed by the loss of the mucous membrane, is frequently indurated, by the change which the denuded cellular membrane has undergone, and it is discoloured by the afflux of blood to the part: hence these chronic ulcers are very apparent, even on the peritoneal surface.

Consequent
ulceration.

Carunculous
edges.

The lacteals or absorbent vessels corresponding with these ulcerated glands are not unfrequently rendered distinctly visible by irregular distension with an opaque whitish material resembling tuberculous matter. The glands to which they lead are also variously enlarged; and the tuberculous matter which they contain may be noticed both in the translucent and opaque state.

Tuberculous
matter in
the lacteals
and mesen-
teric glands.

The aggregate glands are very rarely the seat of malignant disease; and I cannot call to mind more than a single instance, in the course of my own inspections, in which

Malignant
disease.

I had reason to suspect its existence. In this case, the disease was supposed to be malignant from the characters which it offered, but they were not sufficiently strongly marked to be conclusive. My suspicion, however, was strengthened by the co-existence of disease, having an undoubtedly malignant character, affecting the pancreas and its vicinity. Both the solitary and aggregate glands participated in the derangement, and formed well-defined rounded elevations, having thickened and somewhat overhanging edges, and bearing a resemblance, in form and size, to Marseilles figs, and still more nearly to the maternal parts of the smaller cotyledons of a ruminating animal.

Parasitical
animals in
the small in-
testines.

The middle portion of the small intestine is the natural habitat of some of the parasitical animals which infest man, and particularly of the *tænia solium*, the *bothrio-cephalus-latus*, and the *ascaris lumbricoides*. Their presence does not appear to produce any serious derangement of the part of the intestine in which they are lodged, but they are frequently accompanied by a thick white viscid secretion. As I have already entered into details respecting these animals, I need not now dwell longer on this subject.

WOUNDS OF INTESTINES.

Wounds of the small intestine are scarcely less interesting from the remarkable phænomena and variety which they present, than they are from the imminent danger to which they expose the life of the patient who has received them. The knowledge of pathological results produced in these cases, whether they terminate in death or recovery, is so essential to the right understanding of the modes of treatment recommended by the best surgeons, that it must be taught in conjunction with the nature and management of these wounds. The whole subject is therefore so ably treated, as a part of the surgical course, by my friend John Morgan, that I may hold myself excused from

going systematically and minutely into it; more especially as it has also been very fully discussed by several surgical authors, who have given abundant illustration in the form of cases and experiments. The most remarkable work of this description is that of my friend Benjamin Travers, which is appealed to as a reference and authority by writers who have since treated of injuries of the intestines.

To these invaluable sources of information I might be the more easily satisfied simply to refer you, from the circumstance of my not having had many instances of the kind within the range of my own personal observation. My attention, however, has been arrested by some of the phænomena; and it will be right that I should communicate to you the result of the consideration to which they have led.

Wounds of the intestines, like those of the stomach, may be inflicted from within or from without. Those of the former class are necessarily rare, since very few objects capable of inflicting them ever pass the pylorus. In the case of the patient who died in Guy's Hospital many months after he had at different intervals swallowed several clasped knives, the intestinal tube was perforated from within; and this circumstance was perhaps the immediate cause of his death. In this instance, the knives were separated into different pieces, by decomposition; and it was by one of the fragments that the injury was inflicted. It is probable, that, in such instances, the edges of the wound embrace the instrument which has inflicted it, and thus prevent the escape of the contents of the canal, and for a short time defer the fatal event. The only class of intestinal wounds likely to engage the care of the professional attendant are those in which the wounds of the intestines have been received from without, and are consequently complicated with injuries of the parietes. It is to such wounds of the intestines that my observations will be directed.

Escape of
their ordi-
nary con-
tents.

A very remarkable circumstance connected with penetrating wounds of the intestines is the non-escape of their contents into the sac of the peritoneum. This, however, is not the uniform result of such wounds; and as the escape of a very small quantity of the contents of the intestine is fully competent to produce the most violent symptoms, it becomes a very interesting inquiry, what are the causes which intercept or promote this escape into the peritoneum.

The preventive cause usually assigned, is, the absolute fulness of the peritoneal sac, and the consequent close adaptation of every point of peritoneal surface to some other part of the same membrane: hence, an opening is no sooner made, than a solid barrier is applied to the orifice. It has been supposed that the part of the intestine on which an injury has been inflicted has happened to be empty at the time of the accident. But I am inclined to believe that we must not look to what may be regarded as a fortunate coincidence for the explanation of a result by no means unfrequent: moreover, I believe I am correct in asserting, that a perforated intestine may contain fluid fæcal matter without any escape being the consequence during life: such, at least, has appeared to me to be the case, when perforation has not been the result of a wound, but of hernia, or of ulceration of the mucous membrane.

The filling up of the orifice of the wound by the protrusion of mucous membrane, which causes an everted edge, is likewise given as a reason accounting for the retention of the contents of the canal; and there seems much reason to suppose, that, with respect to some wounds of no great size, the explanation must be just. This induces me to make an observation respecting the eversion of the edges of the aperture. This evidently depends on the contractions of the fibrous, or, as it is commonly called, muscular layer, in which the mucous membrane does not par-

ticipate. Now, in cases in which the intestine is perforated by ulceration, eversion is prevented by the fact, that the loss of substance is greatest in the mucous coat, less in the contractile fibrous layers, and, for the most part, very much less in the peritoneal coat. It is remarkable, that, in such cases, fatal escape from the canal may take place from extremely small apertures, provided no adhesions had been formed on the peritoneal surface; but it is effectually prevented when such adhesion has been formed, although it may be so slight and tender as to appear incapable of offering any resistance.

The very existence of such tender adhesion is a proof of the quiescence of the surfaces between which it has been formed. I shall have occasion again to advert to this point; and I merely mention it here as an indication of the perfect rest of the wounded parts; which circumstance I believe to be as essential as the universal mutual pressure of the contents of the abdomen to the retention of the intestinal fluids.

The circumstances which may be regarded as favouring the escape of the contents of the wounded intestine into the sac of the peritoneum are, first, the previous existence of ascites. Secondly, the presence of air in the peritoneum would doubtless have this effect; but this occurrence is rare. The existence of air in the intestinal canal—not only in the wounded part, but in its vicinity—is a third cause; and it is probable that this, in conjunction with the want of rest in the wounded part, is the most frequent cause of the fatal escape of the foetal matter. I cannot call to mind any case of absence of attempt at the adhesive process, when time for it to take place had been afforded, by which this conjecture might be confirmed; but the cases to which I alluded in a former Lecture, when speaking of perforation of the stomach, may be regarded as favouring the opinion which I have advanced. Fourthly, may be mentioned, the influence of causes which set in motion the

Escape of
parasitical
animals.

contents of the wounded intestine, and thereby favour their escape into the peritoneum, as exhibited in the case of intestinal worms which have a motion of their own. I have known instances of the escape of these animals from a small artificial anus; and they have been found in the peritoneum, after punctured wounds.

It might be supposed, that the vomiting, which is apt to take place with great obstinacy and to an alarming degree, furnishes presumptive evidence against the quiescence of the wounded intestine: but it may be replied, that this inverted peristaltic action above the suffering part of the canal is probably a consequence of the quiescence of the wounded portion; and if not carried too far, it may possibly be a means of relieving it of matters which, in passing in the opposite direction, would occasion danger, by the probability of their escape. These considerations appear to me to possess another practical bearing; namely, on the employment of purgatives after wounds have been inflicted on the abdomen. Favourable as the passage of stools unquestionably is, I cannot help strongly doubting the propriety of soliciting their production by the administration of purgatives. The evacuation of the canal by the means which nature employs, and, as far as possible, abstinence from all ingesta, with the exception of occasional sips of water to mitigate thirst, would appear, from the reasons which I have offered, to be best calculated to favour the desired result.

The application of sutures or ligatures to wounded intestines, whether for experiment or as a part of treatment, has led to the observation of some curious pathological phenomena.

The application of the interrupted suture to the divided intestine, though it admits the existence of only very small apertures between the stitches, would seem to be almost a certain mode of procuring some escape of matters from the intestine, and consequently to be a

course of treatment most unfavourable to the patient's recovery.

A little reflection on the function of the contractile fibrous layers of the intestines will convince you that the existence of small apertures between the stitches is as necessary a consequence of the application of this suture, as the eversion of the edge and protrusion of the mucous membrane in the case of an incised wound. Moreover, it is likely that the partial traction of the stitches may act as a stimulus to those movements which we must desire for a time to be suspended. The employment of the uninterrupted suture, or of a ligature passed round the edges of the wound, when it is sufficiently small to admit of this being done, both precludes the possibility of escape of matters contained in the intestine, and, by its equal action on the coats of the intestine at the part to which it is applied, would seem to favour, rather than to interfere with the quiescence of the wounded convolution. Cases of wounded intestine, which, after the application of either of these means, proceed to a favourable termination, furnish an illustration of the principle to which I had occasion to allude, when treating of the morbid anatomy of the peritoneum. You may recollect, that I noticed the formation of isolated collections of the non-plastic product of inflammation, which, being shut up by a more plastic effusion, capable of becoming organised, ultimately find a way of escape, by ulceration, into the intestinal canal; or, if the collections be considerable, may be simultaneously making their way into the intestine, and through the parietes, and thus produce an artificial anus. Similar consequences follow the use of the suture or ligature. These, together with a small portion of the intestine which may have to be detached, acting as foreign bodies, are shut up by adhesive inflammation; and subsequently make their escape, by ulceration, through the alimentary canal; and the patient recovers.

If the wound in the parietes have not healed whilst this process has been going forward, artificial anus is a necessary consequence.

By leaving the ends of the suture or ligature, we are almost sure to procure this result, if the additional and unnecessary source of irritation should not fatally interfere with the curative process.

Although patients frequently sink under the influence of comparatively slight penetrating wounds of the abdomen in which the intestines have been concerned, most astonishing cases of recovery are reported, on good authority, to have taken place, even when large portions of intestine have been irrecoverably injured, and when a great extent of the canal had been protruded and exposed for a length of time. It is not my intention to cite these cases, notwithstanding their great interest, as objects of curiosity, or even as illustrations of principle; since you will find them given by the surgical authorities to whom I have already referred you.

There is, however, a case reported, amongst those which have been collected by Benjamin Travers, which seems to claim a comment, in consequence of the extraordinary process of cure which was set up. The patient referred to received an injury which occasioned the loss of a considerable portion of an intestinal convolution. The edges of the mutilated intestine could not unite, for they were not even brought into contact; notwithstanding which, the patient's life was preserved; and he so far recovered, that both the inferior and superior portion of the canal continued to perform their function of transmitting alimentary or excrementitious matters. In this case there was evidently an adventitious portion of canal to be supplied; to effect which, it is evident there must have been concurrently a strong tendency to the partial production of circumscribing plastic organisable lymph, and also a partial impediment to the production of

Reparation
of lost sub-
stance.

the same, without which the adhesive process would have tended to seal up the divided extremities of the gut independently of each other—a process which manifestly could never have been completed. The rationale of the process employed in this case I conceive to be, that whilst plastic inflammation affected those parts of the peritoneum which were in the immediate neighbourhood of the injured intestine, just so much of the inorganisable mucous secretion exuded from the divided, yet approximated, extremities as to serve the purpose of a continuous foreign body between the two. Had this secretion escaped in more than a very small quantity, it must have led to a fatally-diffused and non-plastic peritonitis; but if very small, yet progressively increasing in quantity, it may have served both to mould the deposited lymph, and to keep up the continuity of the canal.

Different degrees of importance are attached by different teachers to the adhesions between the intestine and the parietes. By some they are supposed to be of no consequence whatever; whilst others, from the result of a few cases which have come to their knowledge, may be led to magnify the danger attending them. The danger, in all probability, varies according to the extent and situation of the adhesions. The almost universal adhesion which follows some cases of peritonitis evidently very much interferes with the functions of the intestines; and, on inspection after death, we find an extraordinary softening of the cellular membrane between the coats of the intestines. A ready separation is consequently effected between the coats; and the contractile fibrous layers, in particular, seem to have lost much of their strength and elasticity. The much more partial adhesions which follow other cases of peritonitis, and either connect the convolutions among themselves or unite them to the parietes by means of bands or bridles, give occasion to inconvenience and danger of a different kind. Such adhesions bear a very close resemblance to those produced by the penetrating wounds

Adhesion of
the wounded
parts.

of the abdomen which we are now considering. The danger in these cases does not proceed from any permanent impediment to the peristaltic movements of the intestine, but they expose the patient to sudden and unexpected seizures, which may be of a fatal character, and bear close resemblance to the symptoms attendant on intussusception or strangulated hernia: in fact, the effect produced is precisely of the same character; and depends on a portion of the intestine getting into such a situation, that the band or bridle of adhesion produces stricture on the intestine, or occasions a sharp and sudden change in its direction, by which the progress of its contents is effectually prevented. The adhesions consequent on penetrating wounds are rather less likely to produce these effects than the adhesions depending on more simple peritonitis; since, after wounds, the contact between the united parts is more complete, and the formation of lengthened bridles less probable: there must, however, when the adhesion is very partial, be a similar tendency to give some freedom to the movements of the attached convolution, by allowing the connecting band to be extended in length, whilst it is contracted in breadth. When this effect has been produced, the dangers alluded to cannot fail to exist. They may eventually be removed by the continued elongation of the bridle leading to its division. We have seen that such results attend the bridles of adhesion produced by simple peritonitis and pleuritis; and though much less probable in the case of punctured wounds than in the cases just mentioned, there does not seem to be any absolute impediment to its taking place, when there has been very little if any loss of substance in the intestine.

Cause by
which their
application
& adhesion
is favoured.

A question has been raised as to the circumstances which determine the almost invariable fact, that the wounded intestine remains in contact with the wound in the parietes through which the injury was inflicted. It can scarcely be attributed to chance: nor is it probable that all motion

within the abdomen is suspended for a length of time after the infliction of a violent injury; since it is notorious, that, on opening the abdomen of a very recently-killed animal, the vermicular movements of the intestines are not only conspicuous, but considerable. Such being the case in the recently-dead subject, it cannot be believed that no motion, either of this or of the passive kind, takes place in the wounded living body. It may rather be inferred, that this very important circumstance, in the phænomena attending wounds of the intestines, is brought about by some cause which is always or generally present. This cause I conceive to be, the very movements to which I have been alluding, as appearing to offer a reason against the permanent adaptation of the wounded parts. Whilst admitting the general movements, not only of the intestines, but also of the parietes, it is quite reasonable to suppose that the wounded parts form an exception. The mutual quiescence of these parts seems quite competent to account for the wounded portions remaining in apposition into which they are likely to be brought by the movements of the other portions of the intestine and parietes, more especially as the fact of their having been wounded together is an evidence that such a position is not unnatural to them. It may be allowable to illustrate, and in some degree confirm this speculation, by reference to a phænomenon exhibited by inorganic matter, seeing that a combination of motion and rest is all that is required in the explanation. I allude to the experiments of Cladni and Savard, which have been so beautifully explained by Professor Wheatstone.

If a plate of glass be thrown into vibrations by musical tones, particles of sand, which were uniformly diffused over the surface whilst it was at rest, will be seen to arrange themselves in different lines, indicative of the parts of the plane which are at rest, in relation to others in which the vibrations are taking place. The movements of the intestines will not be disputed by those who may have witnessed

them in a recently-killed animal; and those of the parietes may be safely inferred—not merely from the part they take in respiration, but also from the fact which I pointed out in treating of the serous membranes, when I remarked the absence of adhesion between the peritoneum of the parietes, and extensive coverings of lymph, or false membrane, thrown out over the convolutions generally. If this explanation be admitted with regard to abdominal wounds, it seems calculated to throw some light on a very important physiological fact: I mean, the application of the fimbriated extremity of the Fallopian tube to the ovary at the point at which the vesicle of De Graaf is about to burst.

It will perhaps be said, that in this explanation of the physiological phenomenon two circumstances are required, the existence of which is not demonstrated; namely, the active movements of the Fallopian tube, and that degree of irritation at its fimbriated extremity, and on the surface of the ovary on which the relative quiescence is, by hypothesis, to be brought about. The structure of the Fallopian tube so closely resembles that of an intestine in miniature, that similar movements might be inferred *à priori*; but a fact related to me by Sir Astley Cooper places them beyond a doubt. Having killed a bitch immediately after she had received the male, he threw the internal organs of generation into warm water, when he observed that the movements of the Fallopian tubes were strong, active, and continued. There can be but little doubt that the movements of these parts, when *in situ*, are so modified by the strength of their peritoneal attachments, as to throw the fimbriated extremity upon the ovarium; but it seems necessary that its extremity should remain at rest upon that organ, and that it should be applied to a particular part of it.—The existence of local irritation, both in the extremity of the Fallopian tube and in the part of the ovarium at which the vesicle is to burst, may be both inferred, and also brought to demonstration. In the ovarium, it is shewn by

the turgescence and increased redness and vascularity which mark the point where a vesicle is about to break. We may infer, from the observation of Sir Astley Cooper, that the act of impregnation gives a stimulus to the Fallopian tube, which it can only receive upon its mucous surface; which surface is exposed at the fimbriated extremity, where, also, I am induced, by some pathological facts which I shall hereafter relate, to believe that it is endowed with superior sensibility, in virtue of which it may receive an increase of irritation from the contact of the ovarium.

The demonstration, that no small degree of irritation is excited at these two parts, is furnished by the very frequent occurrence of strong peritoneal adhesion between them, in the bodies of those unhappy females whom vice and misery have reduced to prostitution.

NOTE REGARDING THE LENGTH OF THE INTESTINAL CANAL.

Before quitting the subject of the middle portion of the small intestines,—a subdivision of the canal, which, as I have already observed, presents no natural boundaries, and which I have considered separately, in consequence of its not possessing any strongly-marked peculiarities, such as belong to the portions of the canal of which I have previously spoken, or such as I shall notice in the next Lecture, in which I shall have to speak of the last part of the ileum,—it seems necessary for me to add something respecting the length of this middle portion. It would have been more in accordance with the arrangement which I have hitherto adopted, if I had spoken of the uncertain and variable extent of the middle portion of the intestines in an earlier part of the Lecture, under the head of excess or deficiency. This deviation from system might have been better avoided; but it will, at least, have the advantage of preparing you for the arbitrary division, which I am making, in devoting a separate Lecture to the terminating portion of the small intestine. It would, I believe, be impracticable to establish

a definite length to this portion of the canal; which, without any reference to disease, may be of very different length in different individuals. This circumstance doubtless depends on the mode of development of the intestinal canal. In the early period of foetal, or rather embryonic life, the intestine, whether large or small, has, comparatively, but a short extent. Its length continues progressively to increase: this progressive development proceeds to a greater extent as respects the mucous membrane: it is to this circumstance that we owe the formation of *valvulae conniventes*. Now, if the development, by augmentation in length, be early suspended, we shall have a remarkably short intestine, analogous to that which exists in the carnivorous animal. If, upon the other hand, the development persists, we shall not have a portion of intestine with excessive dimension in calibre, which would interfere with function, but a lengthened tract, approaching to the character of that of the ruminant animal; and instead of any inconvenience resulting from this lengthened course, it may, on the contrary, present advantages as respects some peculiarities in diet. The fact, that variety in dimension in the small intestine is, for the most part, seen in length rather than in diameter, leads me to offer a few remarks respecting tubular structures in general. Whether we admit the supposed derivation of the alimentary canal from the umbilical vesicle, or not, it is clear that many tubular structures commence in a vesicular form, in the production of which there seems to be scarcely any bounds, either in the animal or vegetable economy. Let me recall your attention to those adventitious cysts, the peculiarities of which I described to you as a preliminary step to the observations which I offered regarding the anatomical characters of malignant disease. Even the most fully organized adventitious cysts seem to exhibit plasticity apart from any effort of the *nisus formativus*: their modification in form must therefore be referred to more accidental causes. You may perhaps recollect that I pointed out a remarkable

variety of the cystic form; which consisted in their assuming an elongated form, producing even a filamentous appearance, having sometimes a vesicular dilatation at the free extremity, but in many other cases wanting even this trace of the form whence they are derived. This elongation of the cyst into a tube, and the tendency to carry on increase by augmentation in length, is the point to which I am now particularly inviting your attention. It has been shewn by Sir Astley Cooper, in his admirable work on the structure of the testes, that in early life the tubuli semeniferi are very short; and it may be presumed that at a still earlier period they more nearly resemble the pouches or short *culs de sac* which in some animals are doubtless analogous to the tubuli semeniferi. With this view of the cystiform origin of the tubuli semeniferi their correspondence with the vesicles of De Graaf is sufficiently obvious*. It would seem, that when augmentation by additional length has once commenced, the progressive increase is in that direction, as in the cases before referred to. We see the same thing in the formation and development of the vasa deferentia and the epididymis: it is also seen in the Fallopian tubes.

A familiar instance, which has doubtless presented itself to every one, is seen in the temporal artery; which, under the influence of a determination of blood to the head, short of the production of disease, acquires a lengthened and tortuous course, with little increase in diameter. A very beautiful instance of development of this kind appears to take place in the sanguiferous vessels behind the

* I had for years been impressed with this analogy between the Graafian vesicles and the tubuli of the testes, and illustrated them by comparison with the adventitious serous cysts which exhibit both forms. The permanence of the one, and the bursting of the other, appeared to offer the chief objection to this view. Yet even on this point the analogy will hold good, if we refer to the eel and the lamprey, in which the tubuli are replaced by vesicles or sacs which burst into the peritoneum. For the knowledge of this fact I am indebted to my excellent friend R. Owen.

pleura costalis, in some amphibious mammalia, and more particularly in the dolphin. It is needless that I should adduce further illustration of this principle, of which various examples may be met with both in health and in disease. I must not, however, quit the subject without admitting the converse of this process, by which a tube may be transformed into a pouch or cyst: examples of this change may be adduced both from healthy and diseased processes, though much more frequently from the latter. The cavities of the heart, the stomach, and the urinary bladder may perhaps be regarded as instances of the former; and the distension of the gravid horns of the uterus, which are in fact portions of the Fallopian tubes, are certainly physiological. The cystiform dilatation of the vessels of the chorion, commonly called placental hydatids, aneurism, varix, and numerous forms of cysts developed in glandular structures, and which may be ascribed to the dilatation of their tubuli, are familiar examples of the pathological transformation in question. The preternatural shortness of the small intestine, in consequence of suspension of development, seldom exists to any notable amount, except in cases of monstrosity. They may at a subsequent period be shortened, as the result of peritonitis: but I need not again describe this condition, which I have already noticed when treating of the serous membranes. I may just point out the remarkable counterpart to the advantage which I have noticed as attending the predominance of development in length, which is seen in the contraction likewise taking place in the same direction: had it been otherwise, the progress of alimentary matter would have been materially interfered with. This portion of the intestine may suffer loss in length by the separation and expulsion of part of the intestine; but as I have not, from personal observation, any remarks to add to that which I have already said on this subject, I shall merely again refer you to the elaborate Memoir of my friend Dr. William Thomson, of Edinburgh.

LECTURE XXII.

ON THE MUCOUS MEMBRANES.

THE LAST PORTION OF THE SMALL INTESTINES.

REMARKS ON THIS PART OF THE CANAL—EXCESS IN THE FORM OF DIVERTICULUM—PROLAPSUS OF THE TERMINATION OF THE ILEUM INTO THE CÆCUM—IMPERFECTION OF THE ILEO-CÆCAL VALVE—APPEARANCES CAUSED BY INFLAMMATION—THEIR PECULIAR IMPORTANCE—ABUNDANT SUPPLY OF GLANDS AT THIS PART—PECULIAR PRONENESS TO INFLAMMATION—APPEARS TO BE THE PART FIRST AFFECTED—OBSERVATIONS OF PROFESSOR LOUIS—THREE DISEASES IN WHICH HE STATES THAT THE GLANDS OF FEYER ARE AFFECTED—PECULIAR CUTANEOUS ERUPTION ACCOMPANYING ACUTE INFLAMMATION OF THESE GLANDS—ANALOGY BETWEEN THE AGGREGATE GLANDS AND THE AMYGDALÆ—REMARKS ON PROFESSOR LOUIS'S OBSERVATIONS—QUESTION, IN WHAT DOES THE FEBRILE STATE CONSIST?—LOUIS'S ANALYSIS OF THE ORGANIC LESIONS IN CASES OF FEVER COMPARED WITH THOSE OF OTHER MALADIES—STATE OF THE PHARYNX—ŒSOPHAGUS—STOMACH—SMALL INTESTINES—LARGE INTESTINES—LYMPHATIC GLANDS—SPLEEN—LIVER—KIDNEYS—PAROTID GLANDS—HEART—EPIGLOTTIS—LARYNX—LUNGS—PLEURA—ARACHNOID—SKIN.—PROFESSOR LOUIS'S COMMENTARY—REMARKS ON PROFESSOR LOUIS'S COMMENTS—ON THE TERM TYPHUS—CIRCUMSTANCES IN WHICH TYPHOID SYMPTOMS OCCUR—INFLAMMATION OF THE AGGREGATE GLANDS NOT CONFINED TO CASES OF FEVER—DR. MONRO'S CASE OF ULCERATION.

GENTLEMEN—

ALTHOUGH this portion of the small intestine essentially participates with the portion of small intestine which I have last described as respects the morbid changes to which it is liable, it nevertheless presents so special an object of interest, in a pathological point of view, that I have thought it expedient to speak of it separately. Except in cases of extraordinary distension of the intestines, arising from stricture or other obstruction in the lower bowels, it is not common to observe any remarkable deviation from the normal state, in respect of size, in this part of the small intestine. It is generally of smaller calibre than the other

Remarks on
this part of
the canal.

Excess in
the form of
diverticu-
lum.

parts of the ileum, and consequently considerably less than the jejunum; yet I do not remember that I have seen this portion of the intestine so much contracted as to constitute a morbid appearance. Excess by dilatation I have stated to be rare; and when it does take place, from stricture in the intestine below, and the like causes, it is less considerable than towards the middle of the small intestine. This portion of the ileum appears, however, to be the exclusive seat of a deviation, by excess of a different character; namely, that which consists of a diverticulum given off as a *cul de sac* from the ordinary canal. This anomaly, which is by no means unfrequent, is almost invariably met with at a distance of from nine to fourteen inches from the ileo-colic valve: in fact, I do not remember to have seen it in any other situation. As I have already had occasion to speak of this diverticulum, when treating of the peritoneum, it is needless that I should revert to the arguments which have been used on both sides of the question, as to this malformation being the remains of a communication between the ileum and the umbilical vesicle in the foetal state: it will be right, however, that I should enumerate the varieties of form which these diverticula present, since the mucous membrane participates in these modifications. Sometimes the diverticulum scarcely exceeds an inch in length; whilst at other times it is as much as four or five inches. Sometimes it is of less calibre than the intestine from which it proceeds: it is oftener of nearly the same size; and is occasionally dilated into a considerable pouch. Sometimes the blind extremity is contracted to a point; which I have seen particularly the case when this extremity has been attached by a ligamentous bridle, somewhat like the urachus, to the parietes, on the median line. The most common termination is in a blunt rounded extremity; and this fact appears to me to be one of the principal objections which can be urged against the supposed origin of the diverticulum. Occasionally, the termination, instead of a single rounded extre-

mity, presents several tuberosities or botryoidal projections; but as these appear to depend on the unequal force of the contractile fibrous coat, which has allowed the mucous membrane to protrude in some parts whilst it is repressed in others, I do not see that any conclusion, with respect to original conformation, can be drawn from it. It would be a matter of interest—not only as respects the anomalous development of mucous membrane, but also with regard to the physiological views connected with Meckel's opinions concerning these diverticula—to ascertain how far *valvulae conniventes* and solitary and aggregate glands are supplied to these diverticula; for we can scarcely conceive it possible, that if the diverticulum ilei were merely the persistence of a canal of communication, it would be furnished with these appendages to a highly-developed mucous membrane. I am not aware that the condition of these diverticula, in the points to which I have alluded, has ever been investigated, or that their connection with the physiological inquiry has ever been noticed.

The termination of the ileum sometimes forms a sort of prolapsus into the cæcum, the mucous membrane and its subjacent cellular structure appearing to be swollen and turgid. Sometimes a larger portion of small intestine, consisting of all the coats, to the extent of several inches, passes into the large intestines, by way of intussusception; giving rise to all the urgent and acute symptoms, to which I have already adverted, when speaking of intussusception of the small intestines.

Prolapsus of the termination of the ileum into the cæcum.

The ileo-cæcal valve sometimes loses its power of obstructing the regurgitation of the contents of the large intestines into the small. I believe that this circumstance, which constitutes the essence of what has been called iliac passion, is an occurrence of much greater rarity than has been generally supposed. Although I have frequently heard of fæcal matter being rejected by vomiting, I have never seen an instance in which this event had unequivocally

Imperfection of the ileo-cæcal valve.

taken place; the distinctive and characteristic difference between the odour of the contents of the large and small intestines having, as I believe, not been sufficiently pointed out and insisted upon. I have repeatedly known the contents of the small intestines, when rejected by the mouth, considered as fæcal. Nevertheless, I am far from disputing the fact, that the ileo-colic valve is passed from below upwards;—the most unequivocal proof of this having actually taken place, being furnished by the vomiting of materials which had been received in the form of enemata.

APPEARANCES CAUSED BY INFLAMMATION.

Peculiar importance of appearances caused by inflammation.

The most remarkable and important pathological appearances appertaining to this part of the intestinal canal are unquestionably those which result from inflammation. It is not because these derangements essentially differ from those which I have described, when speaking of the immediately-preceding portion of the small intestine, that I have thought it right to draw your attention to these derangements separately. Although, in fact, there are some structural peculiarities which required to be noticed, it is mainly in consequence of the remarkable proneness to inflammation exhibited at the termination of the ileum, and of the great importance which has justly been ascribed to these derangements, that I have thought it right to adopt the course which I am pursuing.

Abundant supply of glands at this part.

As we approach towards the termination of the ileum, we find the glandular apparatus, but particularly that of the aggregate form, very liberally supplied. At the very termination we sometimes find the whole calibre of the intestine occupied by this structure: in fact, this part of the intestine may be regarded as one of those spots at which peculiar provision is made for mucous secretion. I have already noticed the fauces, the cardia, the pylorus, and the pylori-valvular portion of the duodenum, as thus circumstanced; but of these, it is the fauces alone which can be regarded as

equally remarkable with the termination of the ileum. The necessity for this peculiar provision is, perhaps, to be found in the naturally-diminished size of this part of the canal, and in the greater degree of consistence of the contents of this part of the intestine, in consequence of the privation by absorption which the alimentary matters sustain in their course through the small intestine. Another, and perhaps more important necessity is, I conceive, to be found in the circumstance, that the contents of the intestine, modified as I have just described, have to pass through a still narrower yet limited constriction at the ileo-cæcal valve, where, unless under favour of an abundant lubricating secretion, they could scarcely fail to excite irritation or induce abrasion.

The frequent occurrence of inflammation and ulceration in the inferior portion of the ileum, in cases of fever, is confirmed by the testimony of all the best and most accurate pathologists who, of late years, have investigated the morbid appearances connected with the febrile state. Whatever may have been the views which these pathologists have severally taken with regard to the relation which these derangements bear to the disease, they concur in shewing that it is the glandular apparatus, and more particularly the aggregate glands, which are the principal seat of inflammation. The character of inflammation and ulceration at this part is so essentially that which I have already minutely described as occurring to the two sets of glands in question, that it would involve an absolute repetition were I now to detail the appearances met with at the part with which we are at present occupied. It must however be observed, that it is here that the derangement is most frequently met with; that it is here it is met with in its greatest intensity: and that when inflammation has affected the glands higher up in the canal, it appears to have been by extension from the lower part of the ileum; the derangement being found at this part in the most advanced stage; whilst it is seen to be less and less advanced the higher you ascend the intestine.

Peculiar
proneness of
the ileum to
inflamma-
tion:

it appears to
be the part
first affected.

Though this fact is particularly striking with reference to the acute disease of these glands, as it occurs in conjunction with fever, I believe the remark in general also holds good with respect to the chronic or tubercular ulceration which is met with in patients who are sinking under strumous affections, and more especially under phthisis pulmonalis. It is, perhaps, one of the consequences of the more lingering character of these affections, even after derangement of bowels has taken place, that ulceration is met with over a larger extent of the intestinal canal than is apt to be the case in fever: yet even in phthisis we may often observe, that the ulcerations are more extensive and more numerous towards the termination of the ileum.

Observations of Professor Louis.

Both the acute and the chronic derangements of this part of the alimentary canal have been made the subjects of careful investigation by Professor Louis; and his conclusions, deduced from a prodigious number of minutely detailed cases, merit the greatest respect, not only for the sake of the high authority from which they emanate, but on account of the important influence which they are calculated to exert, both on theory and on practice. With respect to the acute affections of the glands, he has come to the conclusion, that they are confined to two diseases; namely, fever, or at least a particular form of fever, to which he gives the name of *l'affection typhoïde*, and epidemic cholera. By the same process, namely, the employment of the numerical system, he has, with reference to the chronic affections of these glands, arrived at the conclusion, that they are invariably connected with phthisis pulmonalis.

Three diseases in which he states that the glands of Peyer are affected.

Peculiar cutaneous eruption accompanying acute inflammation of these glands.

A curious and important fact has been noticed by Professor Louis, in connection with the inflammation of the glands of Peyer. He has observed, in twenty-six out of thirty-five cases, of the form of fever which he has recorded as connected with the derangement of the aggregate glands, that there was a peculiar form of cutaneous discolouration, which he has described as causing *red lenticular*

patches. They have been most frequent and conspicuous on the abdomen, but they are also seen upon the chest and limbs. They have been seen on the back as well as the fore part of the trunk; but they have been more often noticed—perhaps because more often looked for—in the latter situation: they have been observed to make their appearance on the sixth, seventh, eighth, ninth, and eleventh, and even, in one case, on the thirty-fifth day; and to continue visible for an uncertain time, sometimes lasting several days, and sometimes disappearing as soon as the second day: they have been three, four, or five days in coming out, and have subsided gradually. In some cases, the first have disappeared, and others have succeeded them. When this appearance has been very slight, immersion in a warm bath has rendered it more conspicuous and general. It is remarkable, that a symptom at once superficial and frequent should, till lately, have passed nearly or quite unnoticed. It is a striking fact, concurring with many others, in shewing how imperfect our observations may be, even with regard to facts almost constantly passing under our eyes. I have seen—what I imagine all my medical brethren have seen—somewhat of a livid blush on the bodies of fever patients; but I must confess that I had no idea that cutaneous discolouration was either so frequent or so uniform in its character, as for it to merit being placed amongst the peculiar symptoms of continued fever; nor am I yet practically acquainted with the appearance alluded to, which I must attribute, in part, to my not having sought for it with sufficient care and perseverance. Louis suspects that these patches may have existed in those cases of fever in which he has failed to observe them, as they may have disappeared before the patients came under his notice.

Petechiæ are well known as a cutaneous eruption, not unfrequently concurring with fever, of the kind observed by Louis to co-exist with the derangement of the glands of Peyer as the principal local affection: and I suspect that

other forms of cutaneous eruption will be found to be, at times, associated with the inflammatory state of the glandular apparatus of the intestinal canal. I can scarcely doubt that this was the case with that peculiar spotted rash, bearing some resemblance to the early appearance of small-pox, which was often noticed as an epidemic associated with the prevalence of cholera.

Analogy between the aggregate glands and the amygdalæ.

I may now revert to the analogy which I conceive to exist between the amygdalæ and aggregate glands. There appears to me to be a decided resemblance of structure discoverable in mere general conformation; but I will not insist strongly on this fact, since it may be one of those resemblances which strike some persons, but are unperceived by others. I rather appeal to certain peculiarities connected with their situation and functions, and to the parallel between the derangements to which they are liable. Both the amygdalæ and aggregate glands are associated with solitary follicles, and appear themselves to consist of a combination of follicles constituting a special organ. They both present great varieties in their size, independently of active disease. The tonsils, as I have already noticed when speaking of the upper part of the alimentary canal, are sometimes so small, that they can scarcely be seen to exist between the pillars of the fauces—a state which seems quite consistent with health and the healthy functions of the part. The aggregate glands, as I have before remarked, are often so small, in healthy intestines, that it is very difficult to discover them, insomuch that their existence has been called in question. The amygdalæ are liable to a remarkable degree of enlargement or development; and though this is often an appearance evidently connected with disease, yet it is often obvious that this enlargement exists without any other symptom of disturbed health. The individual possessing such tonsils may be said to be well, though strongly predisposed to cynanche. The counterpart of this observation may be made respecting the glands

of Peyer, which we sometimes find presenting a remarkable degree of development, without any disease appearing to have existed at the time; though, as we have already seen, these highly-developed glands seem to be predisposed to further derangement. In a high degree of hypertrophy of the tonsils and aggregate glands, the similarity of appearance and structure to which I have alluded is much more conspicuous than it is in the perfectly healthy state: in fact, it is so remarkable in some examples, that I think it would be admitted by most.

In each of these structures, when actual inflammation has taken place, we see that it occurs under different forms; and the varieties observable in the one seem to correspond with those of the other. We have in the tonsils bright red injection, with diminished secretion, and considerable constitutional irritation. We have observed a similar state in the aggregate glands. The accumulation of inspissated secretion, and the production of more or less superficial ulceration, are common to both organs. We have inflammation of the tonsils, accompanied with great increase of size, and proceeding to absolute sloughing: the same thing we have seen to be no uncommon occurrence with the aggregate glands. There is also a remarkable similarity in the symptoms accompanying this form of derangement in the two structures.

When cynanche maligna attacks an individual whose enlarged tonsils predispose him to the severest form of the disease accompanied with considerable sloughing, it is attended with the most severe form of fever of typhoid character, and is very generally accompanied by an erythematic but often marbled discolouration of the skin. Numerous pathologists, but especially Professor Louis, have clearly pointed out the connection between many cases of fever and the derangement of the aggregate glands—a derangement often exhibiting a sloughing character, supervening on increased developement: and Louis, who considers typhoid

symptoms as pathognomonic of inflammation of the aggregate glands, has pointed out another feature of resemblance, in the red lenticular patches on the skin in different parts of the body, which he has observed in the majority of cases in which severe inflammation of the aggregate glands was discovered or suspected. The acute inflammation of both these structures are known to occur as epidemics, and to possess peculiar severity in particular districts, and at particular times; and both appear liable to be propagated by contagion; in fact, to be producible by a specific morbid cause.

Remarks on
Professor
Louis's Ob-
servations.

If we admit the facts, which I believe Professor Louis to have drawn up with conscientious accuracy, I do not see how it is possible to evade the conclusions at which he has arrived: nevertheless, I conceive it to be expedient, and in strict accordance with the principles of investigation of which he is the great advocate, that, before his conclusions are admitted to general and exclusive adoption, the field of investigation upon his method should be greatly extended; and also, that the cases already collected should be examined under different combinations. It is not, therefore, as an opponent to the distinguished advocate of the numerical system that I shall attempt to offer a few remarks respecting the views which I apprehend have been, or which may be, taken by some of the disciples of Professor Louis. The facts and observations which he has recorded, in different parts of his works, furnish some of the best arguments against the adoption of the opinion to which I refer.

Without a special caution to the contrary, it appears to me to be altogether presumable, that the inculcation of the doctrine, that in fever the glands of Peyer at the termination of the ileum are always in a state of inflammation—and that, on the other hand, these glands are never affected but in cases of fever—may lead many to adopt the conclusion, that the inflammation of the aggregate glands in question really constitutes the essence of fever. The doctrines of Broussais,

taught with so much zeal and enthusiasm by their author and his disciples, and embraced with avidity by so large a number of admirers both in France and elsewhere—the very name of *gastro-enteritis*, which has been introduced as a term synonymous with, but more correct than *fever*, and which Louis himself has adopted, at least in the title of his work, to convey the same idea—must, I conceive, strongly tend to promote the reception of the idea to which I have alluded. Professor Louis, be it remembered, has adopted a different appellation, to designate the same malady, in the body of the work to which I refer; and, as I have before observed, he uses the term *l'affection typhoïde* to designate the malady in question. I shall not at present offer a comment on the propriety of this name; which certainly does not imply, *per se*, any precise condition of a part of the body on which the disease in question essentially depends. It is therefore, as I have before said, on the uniform concurrence of the lesion and disease in question, as pointed out in the valuable work of the professor, and further insisted on in the able reply which he has made to the examination or criticism which Broussais has published in opposition to the conclusions of Professor Louis, that the idea of the inflammation of the glands of Peyer constituting the essence of fever mainly rests. In considering this very interesting subject, several questions may, I conceive, be started, which would induce us to pause before adopting the conclusion that the essence of fever is inflammation of the aggregate glands. When I stated that other parts of the work of Professor Louis supplied the means of avoiding such a conclusion, I referred to the remarks and observations of the same professor, to which I have already had occasion to call your attention almost at the commencement of my Lectures, on the derangements of the mucous membrane of the alimentary canal. I observed, in speaking of ulcers within the mouth, that we might observe two forms very similar in their appearance, but widely differing

as respects the symptoms which accompany them; the one purely local, and attended with comparatively little pain; the other distressingly painful, and accompanied with general febrile disturbance. I remarked, that this fact seemed to shew the necessity of our being on our guard against regarding certain local affections as essentially the cause of other symptoms having a more general character, and which, according to the Broussaian doctrines, are set up in consequence of the sympathies existing between the spot affected and other parts of the system. Ulcers in the mouth, on the one hand, shew that the local affection may exist without calling up those general symptoms referred to the sympathies of the part; and, on the other, that they indicate that it is necessary that this general disturbance should exist, for the local affection to be attended with the distressing pain and untractable character which mark one of the forms of these ulcers. I remarked, that, in accordance with this view, Professor Louis had adopted precisely a parallel train of reasoning with respect to ulceration and other forms of inflammation of the stomach, in order to shew that gastritis is not essentially fever, and that the lining membrane of the stomach may be seriously injured by highly deleterious agents, without producing a protracted disease, or calling into existence those symptoms, the assemblage of which indicates the presence of the disease called fever. We have abundant proof that the same train of reasoning may be applied to the inflammatory condition of the fauces. This may be stirred up to a great degree by local causes, without calling into existence any of those severe symptoms which accompany the inflammation of that part in cynanche maligna, and even in severe cases of cynanche tonsillaris. Does it not therefore seem reasonable, and consistent with analogy, to presume that similar considerations are to be admitted in the case of the inflammation of the aggregate glands of the small intestine; and that, on the one hand, there may be symptoms of general disturbance of the system prior to,

and often disproportioned to, the inflammation of the elliptical patches; and, on the other hand, that these patches may be deranged with comparatively little general disturbance? Those who have examined a great number of febrile patients must, I conceive, be prepared to admit the truth of the first part of the proposition: and they may find the second part equally confirmed by the result of other inspections, in which the evident traces of past excitation of the aggregate glands have been met with, but where the symptoms of continued fever or cholera, if they existed, have been so slight, that they either passed unobserved, or made no impression upon the patient's friends. It becomes therefore a matter of curious inquiry, What is the state of the system generally, which no one can fail to recognise in his own person, and which most who have acquired any degree of medical tact will scarcely fail to recognise in others—a state which we understand by the term “fever,” which is often the first intimation of disturbed health, yet is soon accompanied with some local affection, and which is extremely liable to succeed to any active local affection, although the tendency to it exhibits striking differences in different individuals?—in other words, what is the condition of the system essential to the existence of fever? This is a question which I purpose to consider hereafter. Before I proceed to enter upon it, I conceive that there will be some advantage in my giving the result of Professor Louis's analysis of the numerous and accurately-described cases from which his conclusions are deduced. This will present the fairest exhibition of his opinion with regard to that malady, the characteristic pathological feature of which he conceives to be inflammation of the Peyerian glands. It is I believe, at the same time, the most concise and accurate statement of the derangements of other parts of the system which we are liable to meet with in the bodies of those who have died of fever. The parts of the body which he describes as occasionally, but with different degrees of

Question. In what does the febrile state consist?

Louis's analysis of the organic lesions in cases of fever, compared with those of other maladies.

frequency, in a state of disease in conjunction with the constant and invariable derangement of the Peyerian glands, are, the pharynx, the œsophagus, the stomach, the small intestine in other parts besides the glands alluded to, the large intestine, the absorbent glands throughout the body, the spleen, the liver and gall-bladder, the kidneys, the heart, the epiglottis, the larynx, the lungs, the pleura, the arachnoid, the brain, and the skin.—In detailing his conclusions respecting these parts, I cannot do better than employ the professor's own words, as far as translation will allow:—

- Pharynx: 1. The pharynx presented one or more lesions in a sixth of the cases examined; namely, false membranes, a purulent infiltration into the submucous cellular membrane, but most frequently ulcerations.
- œsophagus: 2. In the œsophagus, the only form of derangement consisted in ulcerations, which were found in nearly the same number of cases as those of the pharynx. In some cases they were few; in others numerous, but almost always slight.
- Stomach: 3. The stomach.—The size of this organ was seldom increased: its mucous membrane retained its natural state in thirteen of the numerous cases examined: it was softened and reduced in thickness, in bands or stripes, or in a diffused form, in nine cases; and more or less mammillated in different degrees, and to a variable extent, either with or without alteration of colour, in all the remaining cases.
- Small intestine: 4. The small intestine was distended with gas in fourteen cases, but only to a remarkable degree in two. Invagination of a superior into an inferior portion was met with in three subjects: the mucous membrane, as distinct from the Peyerian glands, was white in rather less than a third part of the cases; red, through a variable extent, in seventeen cases; grey in eleven; preserving its natural consistence through the whole length of the intestine in a fifth of the cases; softened to a greater or less extent, and

in different degrees, in all the other cases. The solitary glands near the cæcum were more or less enlarged in a quarter of the cases. With respect to the aggregate glands, which were always more or less altered, he observes, "that their derangement was more severe and deep the nearer they were situated to the cæcum; near to which, perforation, when it existed, was always met with." The corresponding cellular membrane had always undergone some alteration, insomuch as to render it impossible positively to decide whether the lesion commenced in that tissue or the mucous membrane, or whether both had been attacked at the same time.

5. The large intestine was inflated with gas in half the cases, and, in general, to a remarkable degree: at the same time, its parietes either preserved their natural thickness, or were thickened, as we see in the case of the small intestine, when, in consequence of strangulation, it becomes distended with faecal matter. Its mucous membrane was white in thirteen cases; red, to different degrees of extent, in twenty; and grey in nine. The mucous membrane was of a natural consistence in a fourth of the cases; softened, to different degrees, through a space of greater or less extent, and sometimes thickened, in the remaining cases. Eight examples presented a greater or less number of lenticular follicles, in some instances in a state of ulceration: four had hardened patches, small and rounded, and in other respects like those of the ileum. [What these patches are, to which Louis alludes, I confess that I am unable to determine; for I can scarcely suppose that he means it to be inferred that he has met with aggregate glands in the large as well as in the small intestines. I imagine that he must mean, either the enlargement of a few closely-placed follicles, with thickening of the surrounding texture, or tubercular deposit beneath the mucous membrane, whether connected with the follicular apparatus or not.] Fourteen examples presented ulcers; for the most part few, superficial, and of little extent.

Large intestine:

Lymphatic
glands:

6. The lymphatic glands were often in an unhealthy state. Those of the mesentery, which corresponded with the affected elliptical patches in the ileum, were red, enlarged, softened, or otherwise altered in all cases. This (triple?) alteration offered more or less remarkable varieties at the different periods of the malady. The mesenteric glands, which corresponded to the healthy elliptical patches, exhibited some alteration in a fourth part of the cases, but to a much less degree than in the other glands. The glands of the mesocolon were the seat of a similar derangement, commonly severe, but not so in all cases. The cervical glands, and those about the small curvature of the stomach, were, in some instances, red, and swoln to the same extent as those mesenteric glands which corresponded to the healthy aggregate glands. The lymphatic glands about the biliary ducts were violently inflamed, in two cases.

Spleen: 7. With four exceptions, the spleen was more or less severely altered in every case. It was generally swoln and softened, and was not unfrequently four or five times its natural size: and in these cases, it was always very much softened.

Liver: 8. The liver, in a few cases, was a little larger or a little smaller than in the healthy state: it was softened in half the cases; and in some instances to a remarkable degree; in which it was of a pale colour; contained but little blood; and when cut, the incised surface appeared dry: the bile was very abundant, very liquid, reddish or greenish, in the majority of cases; it was turbid in a few.—The gall-bladder contained genuine pus in three subjects.—The mucous membrane was more or less thickened in these cases.

Kidneys: 9. The kidneys were softened, and increased in size, in some subjects: they were manifestly inflamed in one: in general they were healthy. In two cases, the lining membrane of the pelvis was more or less reddened and thickened. In two others, this was the case with the lining membrane of the bladder; and in a third, there was a small ulceration near the meatus.

10. In only one case was there inflammation of the parotid glands. Parotid glands:

11. The heart was healthy in rather more than half the cases: it was more or less softened in the others; and sometimes to an extreme degree, when it was also of a livid red: its wasted parietes were very easily torn; and its cavities only contained a few drops of blood intermingled with air, or else the blood was coagulated but not fibrinous. The opposite state existed in those cases in which the heart was healthy. Heart:

The aorta was of a clear red in most of the cases in which the heart was soft. Sometimes the internal membrane was at the same time soft, yet thicker than is natural. This discolouration, of a red hue, was by no means common, in cases in which the heart was healthy; and then the inflammation was in a slight degree.

12. The epiglottis was red, thickened at its circumference, and covered with a false membrane, in two subjects. It exhibited similar thickening, and partial limited destruction either at its summit or sides, in a sixth of the cases. Epiglottis:

13. The larynx was covered by a false membrane in three cases: in a fourth, there was a small extent of ulceration. Larynx:

14. The lungs were in their natural state, or very nearly so, in a third of the subjects: they were hepatized, or converted into a substance resembling the structure of the spleen, in the other cases, but generally to a small and inconsiderable extent, whether these two lesions existed separately or simultaneously. Lungs:

15. The pleuræ contained from three to thirty ounces of sanguinolent serum, in rather less than half the cases. Pleuræ:

16. The arachnoid was lined to a limited extent, at the upper part of the brain, by a false membrane, which was extremely soft in two cases: the cortical substance of the brain was, in some degree, red or rose-coloured, in seventeen cases. The medullary substance was injected in most Arachnoid:

instances, but generally to a small extent: both substances were softened in seven cases. There was a partial and inconsiderable softening limited to the septum lucidum, or to one of the thalami nervi optici, in two other cases. The cerebellum presented the same lesions as the brain, but in a less number of cases.

Skin. 17. Finally, the skin offered deep traces of erysipelas phlegmonodes, in four cases. It was thickened, or rendered thin, or partially ulcerated or completely destroyed, where blisters had been applied.—Its destruction was still more complete over the sacrum, in a great number of instances. Except the cases of erysipelas, the subcutaneous cellular tissue offered no alteration, save in two subjects: in one, there was an abscess under the lower jaw, and emphysema of the neck in the other.

Professor
Louis's com-
ments.

These lesions, which were found conjoined in a greater or less degree in all the cases, were not all of the same nature, did not all spring from the same cause, were not equally frequent in the subjects cut off at different stages of the disease, and were not all developed at the same period of the complaint.

As to their nature, some were more or less directly the result of inflammation; others appeared to be independent of it. Among the former were, the false membranes of the pharynx and air-passages; the infiltration of pus in the submucous cellular tissue of the pharynx; ulcerations of that organ, of the œsophagus, and of the stomach; the "*état mamelonné*" of the mucous membrane of the latter viscus; its softening in many cases; its softening with thinning in some; alteration, more or less deep, of the elliptic patches of the ileum; that of the corresponding mesenteric glands; softening of the internal membrane of the large intestine in several cases; its hard patches; its ulcerations; the swelling and softening of the mesocolic glands; the redness, with thickening, of the mucous membrane of

the gall-bladder ; the thickening and redness of the pelves of the kidneys ; the softening of the kidneys themselves in one case ; the partial destruction of the epiglottis ; the hepatisation or engorgement of the lungs ; the false membranes upon the arachnoid ; and, finally, erysipelas ; sloughs on the sacrum ; and the ulceration or thickening of the skin in situations in which blisters had been applied.

The changes, independent of inflammation, are, the pale softening of the liver and of the heart ; the redness of the aorta ; the softening of the mucous membrane of the stomach, and of the small and large intestines in some subjects ; the splenization of the lungs ; the effusion of bloody serum into the pleura ; the different conditions of the spleen ; the general softening of the brain ; and the red or roseate colour of the cortical substance of the brain.

Some of these lesions, viz. the ulceration of the pharynx, the œsophagus, and epiglottis, did not occur in those subjects who died from the 8th to the 15th day of the disease ; and were more frequent in those who sunk from the 16th to the 30th, than in those who were cut off at a later period. The other lesions were generally less marked in this latter period than in other periods, and more especially than in the first period.

From the circumstance, that some of these lesions were less marked and less frequent in subjects who died after the 30th day than in those who had sunk earlier, it may be asked, whether this difference depends on these lesions having always been of a less degree in these cases, or rather on their having receded, or made progress towards recovery. And this question is so much the more natural, inasmuch as that the derangement of the elliptical patches of the ileum and of the mesenteric glands had evidently taken such a course, in a great number of cases. Although the affirmative is very probable as respects some cases, it is by no means the case that all the facts militate in its favour : for if this retrograde course had been taken, it might be asked, To what is the

difference of proportion, which we are now considering, to be attributed? This difference ought not to exist, with respect to those lesions of which the traces are deep; such as, the ulcerations of the pharynx and œsophagus, the partial destruction of the epiglottis, and the softening, with diminution of thickness, of the mucous membrane of the stomach; and yet the difference is great. Moreover, if these lesions had been the same in all cases, how are we to account for death having taken place in a few days in some instances, and after a considerable lapse of time in others; where, moreover, there had been no extreme difference in the state of the small intestines; unless we are willing to admit that the secondary lesions are of no importance, which is impossible; or to assert, that existing in different groups of subjects in the same proportion, they differ as to degree? This last view being only a supposition, does not deserve to arrest our attention. The most conclusive reasons in favour of the retrogradation of the lesions in some cases, Louis conceives to be, on the one hand, the fact, that this retrogradation takes place in the aggregate and mesenteric glands; and, on the other, that the grey colour of the mucous membrane of the alimentary canal did not exist in those subjects who were cut off from the 8th to the 20th day of the disorder, but almost exclusively in those who had died after the 25th; and that this colour is one which inflamed organs assume, in returning to their natural state.

Of all these lesions, one only was constant, having taken place in all the subjects. This, observes Professor Louis, was to the alteration of the elliptical patches of the small intestine, to which may be added the derangement of the mesenteric glands. Hence he regarded it as inseparable from the existence of the disease with which we are engaged (*l'affection typhoïde*), and constituting its anatomical character. As this lesion was more or less profound in some subjects who died on the 8th day of the disease,—as in a great number of cases the first symptoms indicated a lesion

of the intestinal canal, and as the derangement of the small intestine was more profound than those of the colon, which was healthy in many cases,—he concluded that the alteration of the elliptical patches commenced at the onset of the disease. Although the other lesions can only be considered accessory or consequitive, he believes that they often commence at an early period; since several of these, and especially the various softenings, were more marked and considerable in those subjects who were cut off between the 8th and 15th days of the disease, than in those who had sunk at a more-advanced period.

The anatomical character of the typhoid affection becomes, in his opinion, still more apparent, by a comparison of the lesions which have just been enumerated with those which are met with in subjects which have been cut off by other acute diseases. For if we except the elliptical patches of the ileum, the ulcers in the pharynx, œsophagus, and epiglottis, which did not occur in any of them (that is to say, in the large number of subjects who have died of other acute diseases besides the typhoid affection), these lesions were the same. The only difference was in the proportion of the cases in which they occurred: and this difference only existed with respect to some organs; for with others, as, for example, the gastro-intestinal mucous membrane, no difference was perceptible. The mucous membrane of the stomach was even more often in a healthy state in subjects who had died of the typhoid affection than in those who had sunk under other acute diseases. And, as we cannot say that peri-pneumony is gastro-perito-pneumony—although we often find, in opening the bodies of those who had died of inflammation of the lungs, a more or less considerable alteration of the mucous membrane of the stomach—so we can with no more propriety call a case of typhoid affection a gastro-interitis.

But these frequent lesions of the mucous membrane of the alimentary canal, and of various other organs, occurring in persons who have died of acute disease, whatever may have been their nature, prove, that when an affection of this

kind produces a febrile state of some considerable duration, the greater number of the viscera soon become the seat of more or less considerable lesion;—the mucous membrane of the alimentary canal in common with others, but not more frequently, and even less so than some; as, for example, the spleen, which was more or less deranged in all the cases of typhoid affection, except four. This is an important law, which, as Louis observes—for I am still using his words—greatly simplifies the study of pathology, and which might, perhaps, have been discovered *à priori*: for what cause appears more capable of producing diseases and lesions of various kinds than febrile disturbance of greater or less violence and often of long duration.

Since the ulceration of the pharynx and œsophagus were only met with in a small number of individuals attacked with typhoid affection, and in no other case, they are also to be considered as forming one of the anatomical but secondary characters of typhoid affection: they are, however, characters of great value; because it would suffice to find a few ulcerations of the pharynx or œsophagus in a subject who had sunk under an acute disease, to point out, almost with absolute certainty, the nature of his affection.

Almost the same might be said of the destruction of the epiglottis. The ulcers of the large intestine are also regarded as, in some sort, characteristic of, and peculiar to, typhoid affection; being much more rare than the consequence of other acute diseases, which have only furnished three examples, amongst the cases that were examined. With the exception of these cases, and of a fourth relating to a small ulcer of the larynx, in a case of peri-pneumony, Louis states, that he has found no ulceration in persons who have died of any acute disease, except in those who have sunk under the typhoid affection: whence it might be concluded, that this disease is distinct from others, not only in the seat and character of the lesion, but also in a predisposition deeply impressed on the membranes which favours their ulceration.

In this respect, he remarks that the typhoid affection is, to other acute diseases, what phthisis is amongst the chronic diseases.

The derangements of the spleen have also some peculiarity in typhoid affection; since, with four exceptions, they occurred in all the cases that died of that affection. There was no exception in those who had died between the 8th and 15th days. They were much less frequent as the result of other affections; in none of which had they attained to the extreme degree often met with in fever cases. There was, in this respect, a kind of contrast between the subjects dying of typhoid affection and those cut off by other acute diseases. In these, the softening of the spleen more often concurred with the small, rather than the large size of the organs; whilst the reverse was the case with those who died with typhoid affection.

Louis concludes this summary of the pathological appearances met with in cases of death from typhoid affection, compared with those discovered after death occurring from other acute diseases, by offering some remarks respecting the employment of counter-irritation, as the means of curative treatment; but as these are foreign to my present purpose, I shall not quote them now.

This summary, derived, as I apprehend, from the careful analysis of a greater number of minutely-detailed cases than have been brought together on any other occasion, well deserves to arrest our attention. Although the universal occurrence of disease of the aggregate glands, in all cases of fever detailed by Louis, is perhaps the most interesting feature of the analysis, and certainly the most intimately connected with our present subject, yet there are some points in this analysis which I shall notice, before I consider the importance to be attached to the derangements of those glands. In the first place, I must observe that there is a striking accordance between the results

Remarks on
Professor
Louis's com-
ments.

obtained by Louis and those of other investigators who, with ample opportunities, have given minute attention to the subject. I may particularly mention the observations of Andral, Dr. Southwood Smith, and Dr. Bright: and, in connection with the last-mentioned name, I may be allowed to notice my own pretty numerous inspections;—which, though they unhappily want the minuteness of detail with respect to the number of organs examined, as is found in Louis's histories, are probably as minute, accurate, and numerous as those of most other inquirers.

With respect to the appearance of some organs, whose derangement from the normal state, in conjunction with fever, I believe Louis to have accurately noticed, I must confess that I somewhat differ from him respecting the characters which he assigns to them. Thus, amongst the alterations which he refers to an inflammatory cause, there are one or two which do not necessarily imply the pre-existence of inflammation; such are, the mammillated condition of the mucous membrane of the stomach, respecting the nature of which I have fully stated my views on a former occasion; and the simple softening, and softening with attenuation of the same part, to which I have also alluded, and which I believe, in many cases, cannot be regarded as the effect of inflammation. On the other hand, amongst those appearances which Louis regards as foreign to inflammation, I observe some which I conceive to be intimately connected with a state very similar to, if not identical with inflammation. Different appearances of the spleen, connected with the softening of that organ, are very probably dependent on an inflammatory state. As I have not yet spoken of the pathological appearances of solid parts, it would be premature for me to enter minutely into this question at present; but I may observe, that the opaquish white material which often lowers the intensity of colour in a softened spleen looks, to me, very much like a separation of coagulable lymph by inflam-

mation: and I believe that a similar remark applies to a pale yellow and soft condition of the liver in some cases, especially when the appearance is partial. The splenization of the lungs I conceive to be what has been noticed and described as pneumonia of the dying; in which affection the state of the patient's system generally precludes the possibility of the production of active symptoms, whilst at the same time the change of texture effected is something more than mere sanguineous engorgement; in this important respect, that there is a separation of the constituents of the blood, giving a permanent solidity to the texture of the lung, which is very different from coagulation of blood in its cells, yet quite compatible with the extraordinary lacerability of its pulmonary texture. The redness of the cortical substance of the brain must, if I am not mistaken, be, in some instances at least, regarded as indicative of inflammatory irritation. I have noticed it where a considerable cerebral disturbance had been observed during life; and I imagine that it throws some light on the active delirium which is acknowledged often to accompany cases of arachnitis. It is not easy to conceive how mere inflammation of a membrane can produce active delirium, independently of alteration in the organ itself most intimately connected with the operation of mind. If, however, the cortical substance of the brain becomes more or less inflamed or irritated, either as a consequence of arachnitis or from the same cause which produces the one producing the other also, the difficulty is removed.

Although the all but invariable existence of derangement of the aggregate glands in the cases of fever related by Professor Louis, and the confirmation of the truth of his statements to be found in the testimony of several good and trustworthy observers, might lead one to adopt the conclusion that fever is the result of local inflammation, and that that inflammation has its seat in the aggregate glands

of the small intestines; that the symptoms which arrest our attention are the result of the morbid sympathies connected with this part of the alimentary canal; and that the other local derangements, being less uniformly present, are to be regarded as secondary or accessory to the affection of the aggregate glands; I must confess that I hesitate to adopt this conclusion; since it appears to me, that, with the admission of all the established facts, a somewhat modified explanation might be given. I have already stated my belief, that the aggregate glands of the small intestines are structures in some respects analogous to the amygdalæ; and I apprehend that we shall find, that following up this analogy will tend in some degree to elucidate the subject; since the affected parts come under our observation in the one case, which they cannot do in the other. With respect to the tonsils, it is notorious that we have the common form of cynanche tonsillaris; to which some individuals are particularly liable, when any undue exposure to atmospheric influence deranges their health. We have also, as an affection of the same parts, the more severe form of cynanche maligna; which may often, if not generally, be traced to infection as its exciting cause. When this disease assumes its worst form, the fever which is present is, I believe, universally admitted to be of that form which is designated as typhus. The progress of the local derangement is, to a great degree, the measure of the severity of the other symptoms; and no doubt, I apprehend, exists, in the mind of any pathologist, as to the inflammation and sloughing of the amygdalæ and neighbouring parts being the principal local affection, although febrile disturbance may unquestionably have existed before the local affection became apparent. This statement, which is the expression of a fact, is, I believe, in strict accordance with the remarks of Louis with respect to some local derangements; as for example, small-pox, and other exanthemata, which in many respects bear a close analogy to continued fever. We must

therefore, as I have before observed, look for something besides the local affection, as essential to the existence of the febrile state. What I believe this condition to be, I shall in my next Lecture endeavour to explain to you. But to return to the aggregate glands. It appears from the researches of the most recent pathologists, amongst whom Professor Louis may be placed in the first rank, that the aggregate glands at and near the termination of the small intestine are the frequent seat of acute inflammation, accompanied by a train of symptoms constituting what is universally recognised as fever. Such is also the case with the inflammation of the tonsils in cynanche tonsillaris. We have, moreover, a severe form of inflammation of these glands running a rapid course, proceeding to ulceration, accompanied with discolouration of the skin, marked by great prostration of vital power, and designated by the terms "putrid," "typhoid," "adynamic," &c., prevailing epidemically, spreading by contagion, aggravated by similar causes, and not unfrequently united in the same individual. Thus much I conceive to be strictly borne out by the facts placed before us. But can we go further, and admit, that in all cases of fever the aggregate glands are diseased, any more than that in all cases of fever the tonsil glands are inflamed; or that, when they are diseased, this derangement is to be regarded as the essential, although it may be by far the minor affection; just as a case would be regarded as small-pox, although the patient may have had but few pustules, and been carried off by some affection of the head, chest, or abdomen, as the immediate cause of death? This I do not believe to be the case. Although, in my own experience, the derangement of the aggregate glands has certainly been detected in most of the fatal cases of fever which I have examined, I am persuaded that I have examined cases which during life had presented the characteristic symptoms of fever, in which the aggregate glands, so far from being severely deranged, have been barely discernible, whilst the cerebral or thoracic

derangements have been very considerable. In this assertion I am supported by Dr. Southwood Smith, who has long enjoyed most favourable opportunities for investigating the fevers of the inhabitants of London and its vicinity. Our observations have been made upon the same class of patients; yet our conclusions have been perfectly independent of each other, as I had not until lately consulted his observations.

Professor Louis has not proposed to exchange the old term "fever" for one designating the seat of what he leaves us to conclude that he believes to be the essential and characteristic derangement; as Broussais has done in adopting the term "gastro-enteritis." It would, I conceive, be more strictly accurate, and consequently more conducive to the interest of pathology, had he done so; but he has adopted a term which I conceive to be liable to considerable objection. Typhoid affection is the term which, if we may judge of the meaning which he assigns to it from the examples which he has given, he holds as synonymous with common continued fever. But what does "typhoid" mean? I would construe it to signify "like typhus": consequently, it is not typhus itself, since *nullum simile est idem*. I will lay but little stress on this objection, since frequent usage seems almost to have sanctioned it, by designating by the name of "typhoid" cases of fever which are really regarded as typhus. It is of more importance to observe, that the limits of cases of fever which are really to be regarded as typhus are very imperfectly and obscurely defined; so that we hear what is called typhus fever by one practitioner refused to be regarded as such by another. Moreover, it is notorious that fever of that kind called synochus only acquires the character of typhus in its advanced stages. If we regard as essential to the character of typhus the existence of those indications of greatly-impaired vital energy, and the tendency to corruption, both of the fluids and solids, which the older medical men recognised by the

term "putridity", we shall find it necessary to exclude very many of those cases to which Louis gives the name of typhoid affection, and which really belong to a class of fevers of which the most remarkable pathological symptom is the derangement of the aggregate glands of the ileum. On the other hand, the admission of the extreme depression of vital power, with furred and dark tongue, sordes on the teeth, and an offensive state of the fluids approaching to putridity, are met with in cases in which this state is only symptomatic, and which I apprehend Professor Louis would not wish to include in the group of cases of typhoid affection. I allude to cases in which the symptoms usually regarded as characteristic of typhus fever supervene on dangerous local affections; such as, compound fracture, extreme cases of sloughing, venereal sores, erysipelas, and the like. Such cases, I conceive, cannot be brought within the range of those which consist of idiopathic inflammation of the aggregate glands: and even should it be found that in some of these cases the aggregate glands have become affected, I think it will go far to shew that this pathological condition is not the essence and cause of fever, but that fibrile disturbance being produced, these glands are the parts particularly disposed to become the seat of local affection, as a secondary event. I conceive that it goes some way towards confirming this view, that we find derangement of the aggregate glands of the ileum in other cases besides those in which, as I have before remarked, their disturbance may be as correctly regarded as the essential and primary affection as that of the tonsils in cynanche tonsillaris and cynanche maligna. The researches of Louis himself have concurred with those of other pathologists, to shew that these glands are affected in at least one other disease besides that which is commonly understood by the name of "fever": I allude to cholera. Their derangement is unquestionably very frequent in scarlet fever; which, although allied to common fever, is nevertheless a distinct disease, of which the

Inflam-
mation of the
aggregate
glands not
confined to
cases of
fever.

characteristic feature is a different local affection. The patches of aggregate glands may be inflamed by the swallowing of arsenic, as I have myself witnessed: and as this is the case, there is little doubt they may be also affected by other agents, whether received as ingesta, or produced as secretions within the alimentary canal itself.

Dr. Monro's
case of ulcer-
ation.

Dr. Monro mentions a large irregular ulcer, about two inches from the ileo-colic valve. It occupied the whole circumference, and had destroyed the muscular and mucous coats. The small intestines were of a dark livid colour, adhered in many places to each other, and were much distended by fluid fæces. These appearances were found in the body of a man who died, on the fifth day, of an acute attack, which appeared to be brought on by drinking largely of cold beer whilst he was in a state of profuse perspiration. His symptoms were, urgent pain, obstinate constipation, tenesmus, and frequent discharge of blood, vomiting, distension of the abdomen, and foul tongue.

LECTURE XXIII.

ON THE MUCOUS MEMBRANES.

THE LAST PORTION OF THE ILEUM.—CONSIDERATIONS RESPECTING FEVER &c.

SPECULATION EARLY ENGAGED WITH THE NATURE OF FEVER—A GLANCE AT SOME ANCIENT OPINIONS — CULLEN — BROWN — THE NEW ITALIAN DOCTRINE — TWO CLASSES OF THEORIES — DR. MARCUS — DR. CLUTTERBUCK — BROUSSAIS — IMPORTANT RESULT OF HIS VIEWS — ANOTHER VIEW REGARDING THE NATURE OF FEVER — SUSPENSION OF THE UNIVERSAL MOLECULAR CHANGES — PROOFS OF THE REALITY OF THIS CHANGE DURING HEALTH — ARGUMENTS IN SUPPORT OF ITS SUSPENSION TO A GREATER OR LESS DEGREE IN FEVER — RIGORS, AND DEPRESSION OF TEMPERATURE — ABSENCE OF WASTING — DOUBT AS TO THE MODE IN WHICH THE EXTREME VESSELS AID THE CIRCULATION — DISTURBANCE OF THE HEART'S ACTION — ELEVATION OF TEMPERATURE — DR. EDWARDS'S REMARK ON THIS SUBJECT — EXPLANATION OF PHENOMENA ATTENDING THE SOLUTION OF FEVER — NOTICE OF A REMARKABLE SYMPTOM — BROUSSAIS' DIFFICULTY WITH REGARD TO CRISES — OF THE CHANGES IN THE URINE — CHANGES IN THE CONDITION OF THE SOLIDS — ULCERS — SLOUGHS AND SORES ON THE SACRUM, &c. — EMACIATION — FALLING-OFF OF THE HAIR — ALTERATION OF THE NAILS — RAPID GROWTH DURING CONVALESCENCE — ACCELERATION OF THE VISIBLE SIGNS OF AGE — OLD IDEAS RESPECTING PUTRIDITY NOT WHOLLY ERRONEOUS — EXAMPLES TAKEN FROM COLD-BLOODED ANIMALS — PERIODICITY — REMARK RESPECTING THE APYREXIA OF AGUE AND REMISSIONS IN FEVER — CONFIRMATION DERIVED FROM REMEDIAL MEASURES — BLOOD-LETTING — PURGATIVES — OF THE EXCESSIVE DREAD OF PURGATIVES — OF THE ABUSE OF PURGATIVES — EMETICS — COLD AFFUSION AND BATHS — MERCURY — OF THE EXPLANATION OF SYMPTOMS BY REFERENCE TO SYMPATHY — THE KNOWLEDGE OF PATHOLOGICAL ANATOMY NOT SUFFICIENT — SYMPATHETIC OR RESULTING AFFECTION DEPENDENT ON THE SEAT OF THE PRIMARY AFFECTION, AND ALSO ON THE NATURE OF THE DERANGEMENT, INDEPENDENTLY OF SITUATION — ILLUSTRATION DRAWN FROM INTESTINAL DISEASE — CHOLERA — PERFORATING ULCERS — STRANGULATED HERNIA — INFLAMMATION OF THE GLANDS OF PEYER — HYDROSIS — INFLUENZA — REMARKS ON THE SYMPTOMS WHICH CONSTITUTE THE CHARACTER OF TYPHUS — NOT ESSENTIALLY CONNECTED WITH THE DERANGEMENT OF THE GLANDS OF PEYER — DISSECTION, WOUNDS, &c. — SLOUGHING VENEREAL SORES — CARBUNCLE — PNEUMONIA — CYNANCHE MALIGNA — COMPARISON BETWEEN THIS AFFECTION AND THE FEVER ATTENDING INFLAMMATION OF THE GLANDS OF PEYER — THE TWO AFFECTIONS SOMETIMES UNITED. — OF THE AGES AT WHICH THE PEYERIAN GLANDS ARE FOUND AFFECTED.

—REMARKS ON THE PRECEDING SUBJECTS — ILLUSTRATIONS — INOCULATION — THEORY APPLIED TO PRACTICE — SUCCESSFUL PRACTITIONERS — LOCAL APPEARANCES THE INDICES OF THE GENERAL STATE — REMARKS ON THE DIFFERENT MODES OF TREATMENT APPLICABLE TO THE PLASTIC AND TO THE NON-PLASTIC FORMS OF INFLAMMATION.

GENTLEMEN—

Speculation
early en-
gaged with
the nature
of fever.

THE great importance of that derangement of the healthy state of the system which constitutes what is generally known by the name of “fever” has, in all ages since medicine has been known as a science or practised as an art, been seen in a peculiar manner to arrest the attention of those engaged with the consideration of disease: yet, from its inherent difficulties, it has always formed a sort of stumbling-block to every theorist who has attempted to explain it; whilst simple observations connected with the subject, and apart from speculation, from the labours of Hippocrates down to those of Louis, have preserved their value, and raised and sustained the reputation of their authors. The consciousness of this common fate, which has attended all speculators on the subject of fever, has made me backward in bringing into notice views which I have long entertained without seeing any reason to abandon them; and when I am about to explain them to you, I wish you to receive them merely as conjectures, claiming further inquiry before they can be adopted or rejected. Though I shall not attempt to give the history of the speculations which have prevailed respecting the nature of fever, I shall briefly point out the prominent features which they have assumed, that it may be apparent in what respect my speculations differ from or agree with those which have preceded them. The oldest medical writers, comprehending the Greek physicians and their disciples, held the opinion, that, in fever, a kind of *fermentation* was going forward, for the purpose of separating from the system the matters by which it is offended. Boerhaave and his disciples looked to a more mechanical cause, and referred fever to *error loci*; and

A glance at
some an-
cient opi-
nions.

believed that certain corpuscles, in the course of circulation, found their way into vessels not designed by nature to receive them. Stahl, and his follower, Cullen, paying more attention than their predecessors to the nervous sensibility of the system, referred fever, in its essence, to a *spasm in the extreme vessels*. Darwin, and more especially Brown, laid particular stress on the excitability of the system; and referred the phenomena of fever to the *exaltation and excess of excitability, and to the opposite state, consisting in its prostration and deficiency*. Brown set forth his views with so much address and attractive simplicity, that they rapidly gained an extensive but short-lived adoption.

Even now they can scarcely be regarded as wholly abandoned, since much of the principle has been worked into the construction of the new Italian doctrine founded by the learned and talented Razori, and promulgated with great zeal and ability by Thomasini and other illustrious disciples. As far as the application to practice is concerned, there can be no question that the Italians have greatly improved upon Brown and his immediate disciples, by the complete transposition which they have made in the application of Brown's principle to the explanation and treatment of disease; seeing that they regard as *sthenic*—and consequently requiring antiphlogistic treatment—many diseases which Brown had supposed to be *asthenic*, and demanding wine, opium, and the like.

Almost the same course has been pursued, in France, by Broussais; who though himself the author of a new and very different medical doctrine with respect to the nature of fever, has nevertheless borrowed largely from Brown. Like the Italians, he has wisely made a complete transposition in the application. In the different doctrines respecting the nature of fever which I have now named, there is this agreement between them all, that they contemplate fever as essentially consisting of a general derangement of the whole system. Another group of doctrinarians, however differing among

Cullen.

Brown.

The new
Italian doctrine.Two classes
of theories.

themselves in the detail, concur in this, that they regard fever as essentially dependent on some local inflammation. Dr. Marcus, who strongly contended for this view, considered all fever to depend on inflammation, the seat of which varies according to the character of the fever, whether typhus, hectic, or of any other character. Dr. Clutterbuck, on the same principle, pointed out inflammation of the brain, or its membranes, as the *primum mobile* of the disturbance which we find in fever. The more general and more accurate investigation of the morbid appearances discoverable after death has exposed the extent and frequency of other derangements, the consequence of inflammation, and taking place in the bodies of those who labour under fever. The most remarkable of the doctrines respecting the nature of fever which find a place in the group which I am now considering, is that of Professor Broussais, whom I have just mentioned as having adopted some of the views of Brown, in the construction of his edifice. Broussais considers fever as essentially depending on inflammation of the stomach and intestines;—an inflammation which he considered his predecessors to have either wholly lost sight of, or, if they observed, to have mistaken, with respect to its relation to disease. With great address, he has pointed out, in close connection with the commencement of fever, the loss of appetite, nausea, sickness, tenderness on pressure at the pit of the stomach, the foul tongue, offensive breath, &c., as indications of the primary inflammation of the mucous membrane of the stomach; and suppressed, excessive or otherwise altered alvine secretions, tympanitis, hæmorrhage from the bowels, &c., as indicative of the derangement of the intestinal mucous membrane. With equal address he has accounted for most of the other symptoms met with in fever; such as, the accelerated pulse, the elevated temperature, the disturbed sensorium, the altered secretion of bile, urine, &c., as resulting from the sympathies by which the stomach and intestines are connected with other

parts of the system. If febrile disturbance follow any other local affection, it is explained by Broussais to be the consequence of gastro-enteritis having been set up as a secondary affection. In the numerous inspections which he has made and appealed to, he doubtless found some inflammation of some parts of the alimentary canal; but there can be no doubt that he also mistook different appearances as indicative of the pre-existence of inflammation which had really no connection with that state. I have endeavoured, in the course of my preceding Lectures, to put you on your guard against some of these sources of fallacy. These views of Professor Broussais merit careful attention, not only on account of the extent and enthusiasm by which they have been adopted, but on account of some important points of practice connected with them. The object of the treatment of fever being to subdue the local inflammation on which the existence of the malady depends, essentially consists, according to Broussais, in applying leeches to the abdomen, but especially to the epigastrium; enjoining the most rigid abstinence from all ingesta, except some mild diluents and demulcents; and scrupulously abstaining from all emetics and purgatives, lest they should aggravate the primary affection; whilst inactivity of the bowels is to be patiently allowed, in order that the retained fæces may act as poultices to the inflamed mucous membrane.

Although we may not adopt the views of Broussais, either with respect to the theory or practice, to the extent to which he has carried them, there can be no doubt of his having rendered great service to his professional brethren, in the treatment of fever, by directing increased attention to the advantages of local depletion, and to the importance of abstaining from all needless irritation of the alimentary canal. These, however, were points which, though they had been sadly neglected, were by no means wholly new. Prost, Baglivi, Rega, Heberden, and others, had strongly insisted on the importance of this mode of treatment, and

Important
results of the
views of
Broussais.

on the symptoms which indicate the necessity of it ; but they had not raised the theoretical superstructure which Broussais has done, and their important practical remarks were very much forgotten or disregarded. The advantages which the labours of Broussais have procured for our profession are not confined to the productions of his own brain. We owe to the stimulus which he has given, the valuable contributions of Andral, Billard, Louis, Bretonneau, and others ; who have not only greatly enriched our store of important and well-observed facts, but have modified and corrected the brilliant but too-sweeping conceptions of Broussais.

Another view regarding the nature of fever.

I shall now proceed to state what I have conceived to be the condition of the system which constitutes fever ; whether it be produced by the influence of some local inflammation or lesion, or exist by itself, independently of such exciting cause. This latter form, however, if it have an existence, I regard as of much rarer occurrence than has generally been supposed.

Suspension of the universal molecular changes.

Fever I imagine to depend on the suspension, or at least very considerable interruption, of that process by which, during health, the various parts of the system are continually undergoing a change ; the old materials being removed, whilst others are substituted in their place. Of the exact mode in which these changes take place, and of the causes which effect them, we are, and probably shall long continue to be, to a great degree, ignorant ; yet we shall all no doubt agree in attributing them to the circulation of the blood. During the growth of a young animal, there is an obvious necessity for a continual operation of this process, in order to effect the progressive development and increasing size of the different parts, since it is evident that growth is not mere superposition and accumulation. Various facts clearly shew that the same process is going forward in the adult and full-grown, as well as in the young animal. I need not stop here, to prove the truth of a principle which

Proofs of the reality of this change during health.

I believe to be universally admitted: there can be no doubt that the continued exercise of this process is essential to our well-being. The inconvenience and distress produced by the suspension of those functions by which the old materials of the body are thrown off as excrementitious—namely, respiration, cutaneous perspiration, and the production of urine—leave no room to doubt this fact. It seems to be an invariable law, that the active purposes of the living economy cannot be served, for more than a very limited time, by the same particles or molecules.

The process of incessant and universal change of the particles constituting our frames is what we imply by the terms “nutrition” and “interstitial absorption.” It is not merely in its character closely allied to secretion: they are, I believe, essentially parts of the same function. The suspension, diminution, or derangement of one or more secretions is constantly spoken of as an important accessory, in a great variety of forms of disease; but I am not aware that the suspension or interruption of this universal and perpetual function has ever been expressly contemplated in reference to the symptoms of disease. Let us examine how far the interruption of this function will account for the various phænomena which we meet with in fever. If the changes alluded to are performed by the circulation of the blood, it is obvious, that if, on the one hand, the blood does not deposit the materials which it is designed to impart to the system—and if, on the other, it does not receive those elements which it is destined to carry out of the system—the ordinary changes in the blood must be interfered with; and we need not be surprised to find the blood itself not retaining those conditions which belong to it during health. As I am not going to build up a new modification of a humoral pathology, I shall not stop, at present, to inquire in what conditions this modification of the blood may consist. In the mean time, every part of the system is becoming more or less affected by the continued presence of particles

Arguments
in support of
its suspen-
sion to a
greater or
less degree
in fever.

Rigors and
depression
of tempera-
ture.

which have become useless, or even noxious; hence, general lassitude, flying pains, soreness, morbid irritability, rigors, and the imagined sensation of cold. The production of rigors, in particular, deserves a moment's consideration. The researches of Dr. Edwards respecting the influence of physical agents on life have clearly shewn that cold has the effect of retarding all the functions of life, and, in an especial manner, that by which the particles to be rejected from the body are thrown off. We need not therefore be surprised, that when, from any other cause, a suspension of this process is produced, the sensations which ensue should, in degree, resemble those occasioned by cold. Shortly after the sensation of rigor is felt, there is, indeed, a real diminution of temperature; but this is a different state of things—a secondary effect, induced by the alteration which takes place in the distribution of the circulating blood.

Absence of
wasting.

That in the state which we designate by the term “fever” the particles of which our bodies are composed are not thrown off at their usual rate, is shewn by a fact which is often noticed, even by nurses. Notwithstanding a great degree of abstinence from food and the measures of a depleting character which are often resorted to, it frequently happens that the patient does not for a considerable time exhibit any remarkable degree of wasting or emaciation; whence the remark of the old women, that “fever feeds or supports the patient.” Hence, too, the diminution or loss of appetite which almost always exists in fever; let the state of the stomach be what it may. If there be any plausibility in the supposition which I have broached, it may be well to examine how far it will go to the explanation of the phenomena which we observe in the progress of fever; as well as, how far it will explain the operation of the means which have been most successfully employed, and aid us in the direction of their application. I have already noticed the sensation of chilliness which is observed as one amongst the first symptoms of an attack of fever, and which is felt by the

patient even before a real diminution of temperature to any extent has taken place. This perception is often, and perhaps in most cases, followed by a real diminution of temperature upon the surface and extremities: this I imagine principally depends on the diminished circulation in these parts. The suspension of the assistance to the circulation of the blood, which in a state of health is supplied in the extreme vessels, probably concurs with the generally-oppressed state of the system to occasion that impaired circulation through the surface and extremities which occasions their sinking in temperature. I must observe, by the way, that I am by no means inclined to support the idea, that the extreme vessels can in any degree aid in the circulation by any species of contractility. The idea, that the minute arterial branches have a really muscular coat, although the existence of such a coat in the larger trunks may be reasonably called in question, appears to me to be not only perfectly gratuitous, since no evidence of this being the case can be obtained by the most careful examination aided by powerful glasses, but it seems also perfectly inadequate to perform the part assigned to it, were its existence admitted. I am inclined to believe, that whatever assistance circulation receives in the capillary vessels—and this assistance is probably by no means inconsiderable—is the result of an action totally distinct from contractility. I imagine that it depends on the disposal which is made of part of the blood for the purposes of nutrition and secretion. That the motion of fluids may be thus brought about by a power acting precisely the reverse of a *vis a tergo*, in the ordinary sense of the term, is proved by phænomena which take place out of the body. Dr. Franklin has shewn, that certain winds depend on a cause operating in the quarter to which the current of air tends, rather than in the quarter from whence it proceeds; and he adduced as a familiar exemplification, the motion of water, in a canal, which takes place on the opening of a flood-

Doubt as to the mode in which the extreme vessels aid the circulation.

gate. That such a power is actually exerted throughout the system in the healthy living body may, I conceive, be inferred from its manifest partial increase in those situations in which extraordinary increased nutrition or secretion is going forward. As examples of this, I may adduce the increased afflux of blood to the gravid uterus, or to any other part in which the impregnated ovum may exist, in cases of extra-uterine pregnancy: we see it also in the periodical growth of stag's horns, and in the development of adventitious structures of rapid growth. We have also something like ocular demonstration of the fact in the afflux of blood to a part on which leeches are applied.

Disturbance
of the
heart's ac-
tion.

The temporary reduction of temperature from diminished circulation is not the only symptom which a defect in the ordinary disposal of the blood in the extreme vessels seems calculated to produce. On the loss of this assistance to circulation, more must be required to be performed by the heart; and this addition to the office which the heart is required to perform, in conjunction with altered properties in the blood itself, would, I conceive, be quite sufficient to account for some of the alterations which are observed in the character of the pulse, which, when the heart fully responds to the increased stimulus which it has received, often becomes both quick and strong. If we may be allowed in this way to account, first, for the depression of temperature, and then for the modifications of the pulse, how shall we get over another difficulty which presents itself, in the explanation of another symptom, namely, the elevation of the temperature of the body?—how is our hypothetical cause of fever to produce such opposite effects—first occasioning cold, and then heat? When the conjecture which I am now endeavouring to explain first occurred to me, which was long before the publication of Dr. Edwards's work on the "Influence of Physical Agents on Life," I conceived that the increased temperature might be ascribed both to the accelerated circulation occasioned by the heart's

Elevation of
tempera-
ture.

re-action, as already hinted at, and to the universal suspension of sensible and insensible perspiration, by which, during health, the excess of animal heat produced is rapidly carried off. The publication of Dr. Edwards's work, without rendering it necessary for me to abandon either of the two causes of the increase of temperature which I have just assigned, supplies another, still more satisfactory and physiological. He has pointed out the intimate relation which subsists between respiration and the production of animal heat. Now, no one can have experienced or witnessed a paroxysm of fever, without being struck with the greatly-increased rapidity of respiration which commences in the cold stage, and is maintained to a greater or less degree in that of increased heat. This increased activity of respiration, which greatly increases the calorific power of the circulating blood, seems to be the result of obedience to a stimulus which the respiratory organs have received analogous to that which I have alluded to in the case of the heart; and in both instances the re-action may be somewhat excessive. Dr. Edwards has himself noticed the increase of respiration and temperature in the course of a febrile paroxysm. (See Translation, p. 248.)

Dr Edwards's
remark on
this subject.

I may further remark, that the stimulus which in the febrile state produces accelerated respiration is very different from that which induces increased respiration under other circumstances. When we pant, or, in other words, when we breathe deeply and quickly, either to relieve an oppressed chest, when the circulation is disturbed by exercise, or when the decarbonization of the blood is obstructed either by lesion of the organs of respiration or by deterioration of the respired air, we feel an impulse which admits of no refusal, and an irresistible threatening of suffocation, if we attempt to disobey it. I can state, from personal experience, that this is not the case with the accelerated respiration which takes place in fever. When labouring under a state of fever, my attention happened to be

arrested by the rapidity of my respiration. I observed, that the movements of the respiratory muscles had more of a voluntary character than is the case when the respiration is urged by actual dyspnœa; and I found, that, by an effort of the will, the respiration could be greatly retarded, without inducing the sensation of suffocation.

The return of heat after the cold stage, and its elevation beyond the natural standard, may, I believe, be reasonably referred to the process which I have described, and be found to furnish no argument opposed to the view which I have advanced.

Explanation
of phænomena at-
tending the
solution of
fever.

The phænomena which are observed when the hot stage gives place to that of perspiration are, I believe, as satisfactorily accounted for by the theory which I have proposed, as by any other which has been advanced. If we conceive the process, by which the resumption of old particles throughout the system was, by hypothesis, suspended in the former stages of the malady, to be now renewed, the events which are observed in the sweating stage would follow, as a matter of necessity. As soon as the molecular changes, on which secretion as well as nutrition depend, are renewed, the arrears of particles to be thrown off, and the accelerated circulation induced in the former stage, concur to render these processes inordinately active: hence the profuse perspiration, the passing of water loaded with excrementitious matter, and occasionally the diarrhœa, which mark the solution of the febrile state, whenever this takes place sufficiently promptly to produce a manifest crisis. The emaciation, as well as the relief from uneasy feelings, which attend these evacuations by different emunctories, appear to me to be quite consistent with the throwing off of those particles which are unfit longer to remain in the system, and of which an accumulation must, on the hypothesis which I am assuming, have unavoidably taken place. The phænomena attending this salutary transition from the hot to the sweating stage led the ancients, who were often good

observers, to conceive that the *materies morbi*, generated by a species of fermentation during the two first stages, being fully formed, was thrown off in the third stage. The facts which they observed are quite as well accounted for, on my hypothesis, by a mere return to the ordinary functions of parts, as by the gratuitous assumption of the temporary formation and subsequent rejection of a new principle: at the same time, it must be admitted, that the secretions are often altered in character, as well as more abundant on the solution of fever. This, however, is precisely what we might have been led, *à priori*, to believe would be the case; seeing that the particles to be rejected had had time, not only to accumulate, but also to undergo a more advanced degree of deterioration than under ordinary circumstances: hence the excrementitious secretions become preternaturally offensive. I may here take occasion to notice a symptom which I have more than once observed in my own person, on the solution of a febrile stage of several days' duration. When the transition from the hot and oppressed, to the secreting stage, had just taken place—which is sometimes rapid, and always relieving and gratifying—I have noticed a circumstance which, though interesting, was the source of some annoyance. The cutaneous perspiration was attended with an odour, which, though by no means potent and intense, was very peculiar, and very disagreeable. The secretion of saliva underwent a completely corresponding change; becoming a little more abundant than in health, and possessed of a very peculiar faint and disagreeable taste, as distinct as possible from any thing produced either during health or under the influence of dyspepsia. The production of this peculiar perspiration and saliva did not, in my own person, last more than a very short time, perhaps not exceeding two hours. As, on both the occasions on which I observed it, it concurred with a very well-marked and salutary change in the state of the system, I cannot avoid the conclusion that it was closely dependent

Notice of a remarkable symptom.

upon that change; and to me it gave additional plausibility to the speculation which I had entertained. I regarded the peculiar principle on which the character of the saliva and perspiration depended, as a kind of animal rust, produced during the retention of particles which should have been thrown off before they arrived at that state.

Broussais' difficulty with regard to crisis.

The phænomena attending the crisis of fever—which, if I am not mistaken, give considerable strength to the theory which I have advanced—are not only unexplained by those theories which refer the essence of fever to a local cause, but remain as a difficulty in the way of their admission. I have myself heard Broussais, in one of his Lectures in which he was treating on the subject of crises, acknowledge, that whilst we must admit the fact of their occurrence, the phænomena which they present remain unexplained.

If I have succeeded in explaining to you, in a general way, the mode in which the theory which I have proposed may be applied to the stages of an attack of fever, I may now proceed to examine how far it is compatible with some of the details and varieties which we meet with, at particular stages, and in different cases.

Of the changes in the urine.

There is no secretion, the appearances of which have been regarded as more clearly indicative of the progress of the febrile process than that of the kidneys. Whilst the malady continues with little or no remission, the urine, though it may be nearly sufficient in quantity, is far from containing the requisite amount of excrementitious matter: it deposits little or no sediment, and is nearly or quite clear. When, however, the fever declines, but more especially if this is attended by a well-marked crisis, the urine becomes more abundant, and at the same time is so loaded with excrementitious matter, that it is unable to hold it in solution, and affords a copious precipitate. It cannot, I conceive, be objected, that this change in the urine gives no further information than respects the kidneys themselves. These organs seldom present any sensible derangement

which appears to be directly connected with the febrile state: the derangements which may be found in them, in fever patients, being generally of a chronic character, and consequently such as the patient laboured under, independently of his fever. It may be also objected, that in the course of a fever the patient occasionally passes loaded urine, and that consequently the lateritious sediment does not depend upon the solution of the febrile state: yet I believe that even this apparent exception, when examined, is rather favourable than unfavourable to my view. It is well known that fevers, usually called continued fevers, really have a remitting character: we ought therefore to expect, that when the remission of the fever has allowed the temporary return of the functions, the urine, as the index of what has been going forward, should exhibit an evidence of the improvement, which although temporary, has nevertheless taken place. That these remissions are not more complete, like those which occur in a well-marked case of tertian ague, may possibly be ascribed to the extent or severity of some of the local affections which so commonly occur in patients labouring under fever. The suppression or modification of most of the secretions during fever is so generally admitted, that it scarcely needs to arrest our attention any longer: and as the process of nutrition and secretion are very closely allied, if not all but identical, the suspension of nutrition, or, in other words, of those molecular changes which are continually going forward during health, might almost be conceded as a necessary consequence, and the theory which I am proposing be admitted without hesitation. Yet I would wish to notice some of the phænomena observable in the solids which I consider to be favourable to my opinion. It is well known, that ulcers, and other local affections under which a patient may have been labouring at the time at which he was overtaken with fever, and which may have been doing well up to that period, are apt to exhibit a change of character. The secretion upon their surface,

Changes in
the condi-
tion of the
solids.
Ulcers.

Sloughs and
sores on the
sacrum &c.

like other secretions, is suspended, new granulations cease to be produced, the old ones collapse and lose their favourable character, and a greater or less portion of surface presents an appearance approaching almost to that of sphacelus. These modifications in the appearances of an ulcer or sore, and which evidently depend on the state of the solids, are as accurate an index of the febrile state as even the urine itself. There are other sores or ulcers, besides those which may have existed at the time of the invasion of the disease, which originate during its progress, and seem to throw some light upon its nature. The most remarkable of these are the sloughs and ulcers which take place on parts subjected to pressure; as, for example, over the sacrum and trochanters. If the hypothesis be correct, that in the state constituting fever the molecular changes in the solids are to a great degree suspended, it will follow, almost as a matter of course, that not only the process of reparation, where it had been going forward, would be arrested, but that other places would be unable to resist deleterious causes applied to them. Of this description of causes is pressure; which, when considerable, may produce gangrene, and which, when exercised to a less degree, produces uneasiness and absorption, and, if accompanied by friction, abrasion or ulceration also. In the fever patient, pressure injures the soft parts: but upon the hypothesis which we are considering, the particles rendered unfit to remain a part of the system are not removed by interstitial absorption, to be succeeded by others occupying their place, but, on the contrary, remain, and, in those situations in which the injury is greatest, produce a continued slough. Hence, on the solution of the febrile state, these parts do not, like other parts, merely waste by emaciation, which allows of their retaining their structural characters and recovering their bulk when the activity of restored nutrition replaces what may have been lost, but, on the contrary, an entire separation

must take place. These sloughs of fever patients have been ascribed to debility ; but I see no reason why debility should produce a slough, nor do we find sloughs in those patients whose real debility is as great as that of fever patients. The sores produced by pressure in phthisical subjects do not slough, but, on the contrary, are often morbidly clean ; but in these patients, it is evident, from the emaciation which takes place, that, though deposition is defective, interstitial absorption is active. The same principle is illustrated in the clean sores of patients greatly emaciated from other causes besides phthisis.

The tendency to ulceration which exhibits itself in different parts of the mucous system during the progress of fever,—the proof of which you will find in the analysis of Louis's inspections which I have already quoted,—seems to afford further reasons for admitting the suspension of that process by which the integrity of structures is maintained by the interstitial change which unceasingly goes forward during health. The ulcers to which I am now alluding are not of the same character as those on which I have already dwelt so long, as affecting the aggregate glands of the ileum, and which appear to be the result of active inflammation of an idiopathic kind ; but ought, perhaps, rather to be referred to some mechanical or other cause acting upon a particular structure impaired by its participation in the general state of the system : thus they occur in the mouth, where there is pressure or merely slight contact between the lips or cheeks, and gums or teeth ; in the œsophagus, through which the ingesta pass in closer contact than is the case in some other parts of the canal ; and in the stomach, where ingesta remain the longest, and where a direct or inverted peristaltic movement is often going forward.

I have already noticed the remarkable manner in which fever patients maintain for a considerable time their condition as to flesh, notwithstanding their total abstinence from food of every kind. On the subsiding of the fever,

Emaciation. however, rapid emaciation frequently takes place, notwithstanding the return of the patient's appetite. This wasting is a well-known symptom of recovery ; and, as such, it appears to me to be easily accounted for. During the continuance of the febrile condition, time has done its part to render a certain number of molecules in a state to be thrown off. Being retained, they accumulate, and are ready to load the urine and other secretions on the termination of the disease. In the mean time, the digestive organs have not been preparing against the approaching demand ;—emaciation is the consequence. I have observed a difference in the degree of emaciation of fever patients which did not seem to be proportioned to the duration of the disease : some individuals, after a protracted illness in which they had eaten scarcely any thing, have not been equally reduced with others whose illness had lasted a much shorter time. I conceive that this difference may, in some degree, depend on the previous habits of patients. Those who, during health, have been accustomed to take food abundantly, and, by their bodily exertions, to promote the rapidity of that process by which the change of particles constituting their various tissues is continually going forward, are, I believe, the individuals in whom the febrile state occasions the greatest emaciation in proportion to its duration : they seem, as it were, to have established a rate at which particles should be thrown off ; which, to a certain degree, retains its influence during disease, although the particles may not be thrown off. On the other hand, persons of spare habit, with little superfluous flesh, and whose scanty meals supply the means for a tardy exchange of particles throughout the system, may linger for a comparatively long time, and incur only a moderate degree of emaciation at last. Although I have made observations which tend to confirm this explanation, yet I must add, that my data are not sufficiently numerous for me to wish it to be regarded as more than conjectural.

The falling of the hair from the head, which occasionally takes place after the cessation of fever, may be ascribed to the suspension of secretion during the disease, and the subsequent active absorption. Besides the falling off of the old hair and the production of new, there are other appearances which indicate the decided and general change which the function of nutrition has undergone during the existence of fever and the period of convalescence from it. Perhaps there are no parts which more decidedly indicate that the existence of fever has been a sort of disturbed epoch for the system generally, than the finger- and toe-nails. An abrupt line of demarcation often marks the spot at which the ordinary and regular production of horny matter was suspended; whilst the newer horn which succeeds it is marked by ridges and depressions, which for a time record the altered condition of the part from whence the horn proceeded, and the irregularity with which returning nutrition seems for a while to have proceeded. It has often been remarked, that young persons in convalescence from fever grow with remarkable rapidity. This fact, which is confirmed by multiplied observations, appears quite consistent with the theory which I have proposed. It is evident, that the alteration, not only in dimension, but also in proportion, which parts undergo during growth, can only take place under favour of continued molecular change. When, on the solution of fever, the removal of particles to be rejected takes place with extraordinary rapidity, peculiar facility is necessarily afforded to the production of change of dimension. The rapid growth which takes place in young persons labouring under incipient phthisis is doubtless brought about in the same manner: but, in this latter case, increased weakness is the consequence, since with the increase of dimension there is a diminution of material. If the occurrence of a fever accelerates the development and growth of the young, it no less remarkably promotes decrepitude in declining years. It must be notorious, that if a man arrived at a certain age

Falling off
of the hair.

Alteration of
the nails.

Rapid
growth
during con-
valescence.

Accelera-
tion of the
visible signs
of age.

retains much of the vigorous appearance of the prime of life, and then becomes the subject of fever, whether it be of the common continued kind or symptomatic, the appearance of eight or ten years' advance in age is speedily acquired, although he may have passed through his disorder in a favourable manner.

Old ideas
respecting
putridity,
not wholly
erroneous.

In fevers of the worst description, especially towards their termination, symptoms are often observed, both connected with the solids and fluids, which were formerly ascribed to putridity; such as, the mouth being foul and dark, the skin covered with a clammy fetid exudation rather than a genuine perspiration. All the other secretions, when they exist, are similarly altered in character, and extremely offensive; the solids readily producing sloughs, and, where this is not the case, feebly retaining the circulating fluids, so as to favour the production of petechiæ or larger echymoses: the blood, when drawn, does not coagulate in the ordinary manner, so as to produce a regular separation of crassamentum and serum, but constitutes a more or less grumous mass of an offensive odour. When, as must generally be the case with a patient presenting all or any of these symptoms to a marked degree, death takes place, decomposition advances with extraordinary rapidity. Although the idea of putridity has of late been much discarded,—as that state is supposed to be wholly incompatible with life, and the idea of extreme debility and of the necessity for sustenance has been substituted in its place,—yet I must say that I believe that the old idea, when somewhat modified, is the more correct of the two. The greatest possible reduction of strength may take place without producing those symptoms which I have enumerated, and which at least bear a resemblance to those of putrescent decomposition: and the bodies of those who are the most robust do not necessarily resist decomposition for a longer time than those of other persons, when death has taken place. On the hypothesis which I have proposed, the production of symptoms presenting in some respects

the character of putridity would be the consequence most reasonably to be expected from the continuance of a high degree of fever, when both the solids and fluids are charged with numerous particles already become unfit for retention in the system. I have more than once observed, in cold-blooded animals, a circumstance which seems to support the idea that even in the living subject an approach to putridity may take place, and also to shew that this may be the result of a continued interruption of the molecular changes effected by nutrition. On one occasion, I was engaged with my friend Thomas Bell in the dissection of a large tortoise, which had died towards the close of its winter's fast. The different parts of this animal, notwithstanding its recent death, exhaled an offensive odour of decomposition. I observed the same thing in dissecting a large snake of the Python kind, which was recently dead after a long fast. I believe that even before death some of these animals after long fasting exhale an offensive odour.

Examples taken from cold-blooded animals.

There are some interesting and curious phænomena which I have not as yet noticed: I mean those which depend on periodicity; such as, the intermission or remission of the febrile symptoms on certain days, and also the tendency to the production of crisis on particular days. I must confess that the theory which I have proposed does not, in itself, afford any explanation of these phænomena; but I conceive that it is quite as consistent with the fact of their existence as any other theory which has been proposed; and, if I am not mistaken, it is somewhat more so. I must not now attempt to go into the subject of the tendency to periodicity, which the living animal system, and especially that of the human subject, exhibits. In the first place, I have very little to offer respecting it; and, in the second, it is one on which I believe that morbid anatomy can throw no light. It may however be objected, that if fever depends on the condition which I have supposed, the sweating stage of a completely intermitting fever ought to put a stop to the

Periodicity.

Remark respecting the apyrexia of ague and remissions in fever.

disorder, unless it can be shewn that a fresh application of the exciting cause takes place at every paroxysm: and a similar objection might be urged in the case of fevers attended with marked remissions, in which it might be supposed that every gradation of improvement would facilitate another till the cure were effected. Until we know the causes of periodicity, these queries cannot be answered; yet the difficulty may be diminished by the comparison with a somewhat analogous phenomenon. The menstrual evacuation of females doubtless depends on some peculiarity in the function of nutrition in them, during a certain portion of their lives, as well as on the organs immediately concerned. But for this, it might be supposed, that when the system had obtained relief by one evacuation, the equilibrium would be restored, and that a repetition of the evacuation would not be called for. In fact, the equilibrium is restored, and the system may even sink below that point; but, by virtue of that periodicity which we admit whilst we cannot explain it, the equilibrium is repressed in the opposite direction, and a continued series of recurring phenomena is maintained.

Confirma-
tion derived
from reme-
dial mea-
sures.

If the theory, which I have proposed, be correct, it ought to be consistent with the employment of those means which experience has proved to be most useful in the treatment of fever. I shall therefore proceed to examine how far it will bear the application of this test.

Blood-
letting.

None of these means merits more attention, as well as on account of the remarkably conflicting opinions which have been held respecting it as from its own importance, than blood-letting. Besides the obvious effects which all attribute to it—namely, that of reducing the heart's action by lowering the stimulus applied to it both in bulk and quality, and the refrigerating effect of reducing the quantity of that fluid on which the evolution of animal heat depends—I am disposed to attribute much of its febrifuge influence to a third *modus operandi*. I conceive that it has a tendency to renew the performance of those changes which, upon my

hypothesis, are more or less suspended in fever. It does this by creating a demand in the system to compensate for the sudden drain which had been made from it. To meet this demand, a general absorption over the system is provoked; and on this taking place, the object required is in some degree obtained. It is in this way that I believe that fever, at its commencement, has been sometimes cut short by one or more copious bleedings. Later in the complaint, the use of blood-letting is of more doubtful advantage. The febrile state, which has a strong natural tendency to persist for several days and then subside, has taken too firm a hold to admit of being put to flight by active measures of any description: hence it may be regarded as a mal-practice, to attempt by copious blood-letting, or any other very active means, completely to cut short fever at such a stage. Nevertheless, blood-letting, general or topical, may be of great service, both by relieving local congestions, to which different organs are liable, as well as to counteract local inflammations, which, we have seen, are of no uncommon occurrence. Some support to the notion that blood-letting in the early stage of fever may act in the mode which I have described, and renew the molecular changes universally going forward in the healthy system, may be drawn from the known effect of blood-letting in some cases of gangrene, in which it is seen to expedite the process of spontaneous separation between the living and the dead parts.

Purgatives.—Besides the well-known and beneficial exercise which they exert, by relieving the alimentary canal of a load of irritating and offensive secretions, purgatives are probably of use in diminishing or even cutting short fever, by virtue of the stimulus they give to absorption; an effect which is most strikingly exhibited, when purging has been had recourse to in some cases of dropsy. There is scarcely any thing more important in the treatment of fever than discretion in the use of purgatives; and I conceive this discretion cannot be better directed than by a right view of their modes of action.

Of the excessive dread of purgatives.

Notwithstanding the notorious fact, that, in fever, ulceration is a common occurrence in the course of the alimentary canal, we must not, with Broussais and his disciples, be led to reject the use of aperients and purgatives, by regarding these agents as merely irritants to the alimentary canal, and overlook their general influence on the system. The ulcers in the mouth and throat, to which I have compared those of other parts of the alimentary canal in illustration of their morbid anatomy, may also afford us some useful hints in reference to treatment. We are far from objecting to the occasional contact of irritating substances with those ulcerations which depend on spontaneous or constitutional causes, and are characterized by acute sensibility and obstinate indisposition to heal. Much less do we object to the transient passage over them of those irritants which, like saline solutions, have a tendency to open the bowels, and thereby influence the system at large, and promote, in a circuitous but almost certain manner, an improvement in the condition of the ulcers themselves. Common observation, which is generally correct, has led to these means being called, from their effects, "cooling physic"; whilst the Broussaisists, misled by a partial and theoretical view, reject them as stimulating and heating, and calculated to aggravate fever, by increasing the severity of that local inflammation on which they conceive fever essentially to depend. There is, however, an opposite error, to be guarded against by those who are disposed to look upon purgatives as mere evacuants, and consequent refrigerants, without regard to the irritation which they often unquestionably excite. This neglect may, I believe, be regarded as our national error with respect to medical practice, and one which, not without just cause, exposes us to the censure of our continental brethren. This is a point on which the public require to be corrected, as much as their medical attendants. It is no uncommon thing for patients to complain of their treatment, because a cathartic effect is not kept up; and, on the other

Of the abuse of purgatives.

hand, to applaud that by which they are purged beyond what is meet.

Emetics.—Emetics, which have been strongly recommended, especially by Frank, in the early stages of fever, doubtless produce a part of their beneficial effect by relieving the stomach from materials upon which it refuses to perform its part of the digestive process, and which consequently become an offensive load; yet I believe that their effect is likewise of a more general character, and that it admits of an explanation similar to that which I have just offered in regard to purgatives. In the general commotions which attend the action of an emetic, the effect on the system at large is even more marked than in the case of aperients. Although the evacuation may be less considerable in quantity, the effect on secretion and absorption is quite as great. On the former, it is seen in the skin, the lachrymal and salivary glands, the liver, and not unfrequently in the intestines also. The influence of emetics on absorption is well known; and if any doubt remain as to their influence on the changes going forward in connection with the capillary vessels, it may be removed by reference to their efficacy in some cases of ophthalmia.

Emetics.

Cold Affusion.—There is, perhaps, no mode of treatment which has a more decided effect in setting aside or relieving an attack of fever than opportunely and properly-applied cold affusion. I believe that it not merely reduces the inordinate heat which succeeds to the cold stage, and relieves the dry state of the skin on which the accumulation of heat in part depends; but that, by the re-action which it produces, it occasions an increased but more healthy exercise of that eminently vital function by which animal heat is produced; whilst the restored evaporation from the surface keeps its actual temperature within natural limits, and relieves a large portion of the sentient nervous system from excessive excitement. Here, again, the valuable researches of Dr. Edwards throw light on the phænomena which we

Cold Affusion, and Baths.

may observe, and furnish satisfactory explanations altogether consistent with the theory which I have proposed. The use of baths and ablutions, and the free admission of cool air, obviously admit of explanations similar to those which I have just offered respecting cold affusion.

Mercury.

Mercury.—The efficacy of this remedial agent is so variously esteemed by different practitioners, and its *modus operandi* is so variously explained, that it may, at first sight, seem difficult to draw any inferences regarding the nature of fever from the employment of it : yet if the view which I am disposed to take, respecting its influence on the system, be at all correct, there is no means which may be appealed to more satisfactorily.

It is in the severest forms of fever, such as occur in tropical climates, and other alarming maladies of the most acute character, that the energetic employment of mercury, with a view to produce its specific effect upon the system, has been most freely had recourse to, and most strongly commended. According to the advocates of this treatment, the production of the constitutional effects of mercury occasions the solution or mitigation of the malady ; whilst those who dispute its utility contend that the appearance of mercurial action is the result of the giving way of the disease under which the system previously resisted the influence of the medicine.

Neither of these explanations is adverse to my view of the nature of the disease ; but I believe the truth to lie between them, or rather to consist in a combination of the two. The operation of mercury, when not confined to its local effects, but given so as to influence the system, I believe to be to accelerate the rate at which the ever-changing molecules of which our bodies are composed are brought into a state requiring their removal from the system. This idea, which is consistent with the acknowledged effects of mercury, in producing absorption, is also consistent with its deleterious agency, and most probably depends on this

very cause. It is by no means difficult to conceive, that a decisive change in the rate at which the molecules become deteriorated, may, like the employment of purgatives and emetics, give a stimulus to the suspended or languid process of their removal. It is equally reconcileable with this view of the action of mercury, that the production of its sensible effects is a favourable symptom in cases of fever;—seeing, that whether the mercury have occasioned the renewal of these changes, or, these changes having taken place, the mercurial symptoms are permitted, the evidence of these changes is given. I might proceed to point out the application of this view of the operation of mercury to its use in iritis and croup, as well as in some forms of syphilis, and the treatment of other affections in which absorption is required; but this would be wandering too far from the subject before us. I trust you will not find the application difficult or overstrained, if you bear in mind that new deposits are, in general, the most readily absorbed; and that in scorbutus, which, in its general effect on the system, seems to bear some analogy to the state artificially produced by mercury, similar absorption takes place, as has been exemplified in the separation of fractures which have been united. The attempt to explain the operation of mercury, by saying that it produces a new state incompatible with the previous and diseased one, is merely an unproved assumption, conveying no explanation: and the idea that it acts by means of counter-irritation, is equally unsatisfactory; seeing that no counter-irritation produces the same results; and that when it is our object to produce the constitutional effect of mercury, it is an important point to counteract any local irritation which it may excite; and that, in the most satisfactory cases, the beneficial influence may be perceived almost before the mouth is affected, and to an amount which bears no proportion to the degree of ptyalism.

I have already, more than once, had occasion to allude to

Of the explanation of diseases by reference to sympathy.

that pathological theory by which it is attempted to explain the phænomena of disease by reference to the sympathies of remote parts, or of the system in general, with the seat of organic lesion. This theory has been in an especial manner extended and promulgated by Broussais and his disciples. It constitutes the very essence of the system to which they somewhat arrogantly give the name of *physiological doctrine*. With the advocates of this sect, we have seen that fever is a gastro-enteritis, and that all its various forms are referred to the sympathetic derangements of the system connected with inflammation of the stomach and bowels. The researches of Professor Louis, which are incomparably more precise as well as extensive than those of Broussais and his disciples, have unanswerably refuted many of the assertions of Broussais; and they have furnished an incontrovertible argument against the so-called physiological doctrine, by demonstrating, that not merely on the seat of primary lesion, but on the causes which give rise to it, does the character of the attendant illness very much depend. It is to this pathological view which I now desire for a while to recall your attention, believing that it involves considerations of the utmost practical importance, in relation to the diagnosis and treatment of fever, and of several other severe affections. Nobody can be more careful than the founder of the numerical method, not to hazard speculations or advance opinions unsupported by ample concurrent testimony in the shape of facts; but it is possible to present such an array of facts, that the reader may easily be induced to adopt as positive axioms, conclusions which the author may not have absolutely expressed in a separate form. Such, I conceive, is very likely to be the case with Professor Louis's researches into the nature and symptoms of fever, as exhibited in his admirable work *sur l'Affection Typhoïde*, and his subsequent examination of the criticisms of Broussais. The unprejudiced Broussaian, in particular, will be persuaded to give up the views of his master with respect to

the importance and uniform existence of inflammation of the stomach; but he will be likely to apply the purely theoretical part of his doctrines to a more restricted portion of the alimentary canal; and, substituting inflammation of the patches of the aggregate glands for gastro-enteritis, he will doubtless be disposed to attribute the phænomena of fever, and more especially of typhus fever, to the sympathy of the system with the derangements of those glands.

You will surely give me credit for not wishing to undervalue the importance of pathological anatomy, to which I have devoted so large a portion of my time; and which it has not merely been my desire to teach, but to recommend, by example as well as precept: but, admitting to the full its immense importance to diagnosis and the assistance which it has rendered to practice, in enabling us to localize diseases of which the seat was formerly unknown and unsuspected, I am, nevertheless, persuaded that there are other considerations connected with the phænomena of disease, independently of the organ or texture in which it may be primarily situated, which it is of the utmost importance to recognise and distinguish. Whilst, then, I admit the existence of symptoms indicative of the situation of the local affection, and depending upon the peculiar sympathies by which it is connected with other parts of the system, I also believe that there are likewise symptoms which depend upon the peculiar nature of the change going on in the body, whether they be of a general nature, or confined to a particular part or parts. The peculiarities of certain diseases in which particular tissues are specially affected probably owe their character to the fact of such textures being favourable to certain changes, as much as to any sympathies connected with their situation or organization.—I will endeavour to make these generalities intelligible, by applying them to the alimentary canal, and to some of the affections more particularly associated with it. We know that derangements of the abdominal viscera produce a

The knowledge of pathological anatomy not alone sufficient.

Sympathetic or resulting affection dependent on the seat of the primary affection, and also on the nature of the derangement, independently of situation.

Illustration
drawn from
intestinal
disease.

remarkably depressing effect. To a certain degree, this effect is common to all, or most of them; but there are peculiarities attending the derangement of certain parts, which induce us to suspect that they are affected, when these peculiarities present themselves. Thus, when the small intestines are the seat of the affection, we find a remarkable state of collapse; the extremities disposed to be cold and flabby; the countenance depressed, but not presenting the anxiety of heart disease; the respiration affected, without evidence of lung disease. This may even exist to the degree of producing great lividity; the circulation becomes quick, weak, and sometimes but little perceptible; the skin is relaxed; but the perspiration may be either warm or cold, according to the degree of collapse. These general symptoms are liable to be modified by particular circumstances; as, for example, whether the derangement is acute or chronic. In the one case it may proceed to a fatal termination, with a rapidity calculated to produce a suspicion of poisoning; whilst, in the other, they may partake of the protracted character of the malady, and produce an obstinate and lengthened debility which may appear disproportioned to the extent and severity of ascertained disease. It may also happen, that a somewhat similar amount of effect may be produced by the extent and by the severity of the morbid cause. Thus we have in cholera the most urgent and rapidly fatal symptoms, comprehending the extreme of those which I have enumerated, with the addition of cramps, vomiting, &c., which appear to be occasioned by the extent of the derangement, which, there is reason to believe, from the evidence of inspection, affects the whole of the small intestines, and appears, as a consequence, to derange the larger also. Now it is evident, not merely from the inspection of those cases which have been quickly fatal, but also from the occasional rapid recovery of those individuals who have survived the attacks of the disease in its severest form, that the lesion at any particular part has neither been profound nor irre-

Cholera.

parable. I have seen an illustration of the same principle in the case of a female who was carried off after a very few hours' intense suffering from intestinal derangement marked with the symptoms before related, and in whom the lesion detected after death consisted in very extensive diffused redness of the mucous membrane of the small intestines. As a proof that similar effects may be occasioned by very limited disease, provided its character be very severe, I may mention, that I have seen the prostration, lividity, and rapid death, with many of the attendant symptoms of cholera, which were proved, by inspection, to depend on the formation of very few ulcers in the small intestine: they were of considerable size, but so deep as nearly to perforate the coats of intestine, whilst the derangement of the other portions of the canal was either slight or imperceptible. In cases of strangulated hernia, in which a portion of small intestine has descended into the sac, we have other proofs that the intensity of the affection may make up for its limited extent. The affections of the aggregate and solitary glands resemble those of other parts of the small intestine, in producing, according to their extent or severity, a greater or less degree of the depression of the nervous system generally, to which I have alluded. Some cases which Professor Louis has collected fully confirm this statement. We see the same thing in cholera, of which I have already spoken; and of which the essential seat of lesion has been satisfactorily demonstrated to be the Peyerian glands.

Perforating
ulcers.Strangula-
ted hernia.Inflamma-
tion of the
glands of
Peyer.

I have found these glands affected somewhat as in cases of rapidly-fatal cholera, in a patient who died shortly after child-birth, exhibiting that peculiar train of symptoms to which Dr. Blundell has given the name of Hydrosis. I strongly suspect that a further instance, in support of the view which I am taking, is to be found in some of those epidemics to which the term 'Influenza' is given; and in which, in conjunction with symptoms having in general the character of catarrh, there is a very remarkable loss of

Hydrosis.

Influenza.

power, general prostration of system, and slowness of recovery, which seem to be greatly disproportioned to the apparent severity of the symptoms in other respects. Now, I am induced to believe, that in these epidemics, besides the existence of catarrh affecting the respiratory apparatus, the patches of aggregate glands are also generally, but slightly, affected. My reasons for this suspicion are drawn, not merely from the fact that traces of such affection were found when the patient had died of influenza, but that, for a time after the almost universal prevalence of influenza, similar traces of irritation in these patches, and more especially increased opacity, with sprinkling of minute black points, were found in almost every subject, whatever may have been the disease by which death had been caused. It may, I know, be objected, that these appearances were connected with the epidemic of cholera, which had likewise existed a short time before the period to which I refer; and which, in many instances, appeared to shew its general prevalence by the production of bowel irritation, short of absolute cholera. I cannot fully disprove the accuracy of this objection; but having met with the appearances to which I have alluded, when the previous disease had been known to be influenza and not cholera, as well as in others in which there was no proof that cholera, or any affection approaching to it, had existed,—and knowing, also, that the influenza was, in the neighbourhood of London, far more prevalent than cholera at any period of the existence of the epidemic,—I cannot help giving the preference to the opinion which I have now expressed.

I have adduced this example, not merely in illustration of the uniform depression of the system in connection with the derangement of the Peyerian glands, but also to shew that these textures may be deranged without the existence of those peculiar symptoms, which the older medical writers, at least, have agreed to regard as marking the character of typhus; such as, dark dry tongue, sordes on the teeth and

Remarks on
the sym-
ptoms which
constitute
the charac-
ter of
typhus.

lips, petechiæ, a peculiar form of constitutional irritation, attended at times with a degree of delirium, which may seem to mask the form of prostration of which I have been speaking, but which by no means sets it aside. The prostration of strength may, indeed, be most marked and alarming in the intervals of the paroxysms which sometimes take place when delirium exists. At other times, the delirium accompanies the extreme prostration, and assumes a low muttering form. I will not now stop to discuss the question, whether this delirium is the result of a further derangement set up in the brain or its membranes, but pass on to notice other features of this really typhus condition. The older authors have insisted much on the existence of a tendency to putrescence, or breaking-down of the constituents of the blood. There is not unfrequently, in conjunction with the circumstances here enumerated, a striking disposition to the production of sores, having a sloughing character on those parts which are exposed to more pressure than the rest of the body; as, for example, the sacrum and trochanters. We have also, in many cases, the production of a poison, which is supposed to be the cause of the extension of the disease to other individuals.

My object, in reverting to these observations, has been, to shew that the assemblage of symptoms, which amongst medical men have long been regarded as constituting the typhus character, may be absent, when the patches of aggregate glands are affected; and also, that it unquestionably does occur in other cases than those in which the lesion of the glandular apparatus is the first and chief local affection. As cases in which the symptoms characteristic of typhus cannot be ascribed to the derangement of the aggregate glands, I may first mention those instances in which the lesion is situated in one of the extremities, as the best calculated to exhibit the state of the system independently of a primary derangement in the intestines. Since I merely cite them for illustration, it is needless that I should minutely describe

Not essentially connected with the derangement of the glands of Peyer.

Dissection,
wounds, &c.

them. The cases to which I refer are met with after compound fractures, and contused and other severe injuries, which lead to sloughing; and when erysipelas, or hospital gangrene, attacks limbs which may have been the subject of operations in themselves of a trifling character. Slight injuries received in dissection sometimes lead to cases which seem to belong to the group which I have here formed.

Sloughing
venereal
sore.

As instances occurring in different parts of the body, I may mention some of venereal origin, which are marked by rapid and occasionally fatal sloughing, and, like the cases before alluded to, are attended with symptoms of typhus. It may be said, that these last cases depend on the previous general health of the patient; but I believe, that when every allowance is made for the habits of these patients, very much is to be ascribed to a peculiarity in the poison by which the disease has been induced, and that to the peculiar condition of the local affection are the general symptoms to be attributed. The phenomena which I am connecting with the term 'typhus' may present themselves in conjunction with carbuncle; and some cases of pneumonia have been correctly described, and specially pointed out, as connected with similar general symptoms.

Carbuncle.
Pneumonia.

Cynanche
maligna.

The next, and last affection which I shall adduce, and to which I have already had occasion to refer, appears to me to be peculiarly interesting, and particularly calculated to throw light on this discussion. The disease to which I am now referring is cynanche maligna, inducing sloughing of the tonsils and neighbouring parts, and accompanied by the severest form of typhus fever. We not merely perceive the peculiar character of the local affection, and are convinced that the general symptoms depend upon it and are to be considered in degree proportioned to it, but we may observe many of the attendant circumstances bearing the closest analogy to those which are associated with one form of the derangement of the Peyerian glands. This analogy in the pathological symptoms

appears to me to receive an increase of interest from the anatomical analogy which I formerly pointed out. In the inflammations of the amygdalæ, we observe every possible gradation, from simple redness, without perceptible turgescence, to prodigious enlargement, threatening death by suffocation, and proceeding to suppuration, or more or less extensive sloughing. Similar gradations, and similar results, attend the inflammation of the Peyerian glands; and the concomitant fever may, in both cases, be either synocha, typhus, or mixed. Whether we regard the extension of the disease to the surrounding parts, or the mode of derangement set up in the corresponding lymphatic glands, the analogy holds good; and it becomes still more remarkable, when we consider that both are very frequently attended with a peculiar efflorescence on the skin, constituting the well-known redness of scarlet fever in the one case, and the *taches rouges lenticulaires*, which have been so carefully pointed out by Professor Louis in the other. In many instances, the inflammation of both parts may be traced to a specific poison emanating from other individuals, reproduced in the progress of the disease, and liable, under similar laws of contagion, to be further extended to other persons. In addition to this striking analogy, we have the actual association of the two diseases in the same subject. Scarlet fever being an affection seldom admitted into the hospital, the opportunity of examining patients who have died of that disease has seldom fallen in my way: but being strongly inclined, *à priori*, to believe that this combination of derangement existed, I have made considerable inquiry to discover what the experience of others has taught them to be the condition of the lower portion of the ileum in scarlet fever.

Comparison between this affection and the fever attending inflammation of the glands of Peyer.

It did not, however, appear that the condition of the intestinal canal in this respect had generally been noticed with sufficient precision to throw light on the subject; and it was not until I turned to the valuable work of my friend,

The two
affections
sometimes
united.

Dr. Southwood Smith, that I met with those positive details which afford the most satisfactory confirmations of my views. It is scarcely likely that any one will object that the typhoid character of this affection is due to the condition of the Peyerian glands in the combination which I am describing, seeing that the severity of the symptoms is most intimately connected with the state of the tonsils, and that the life or death of the patient appears to have depended on the success with which that local affection has been treated.

By these cases of combination, as well as by others to which I have alluded, we are led to a conclusion, which, though differing from that of Professor Louis, does not throw any doubt on the accuracy of his observations. They confirm the necessity, on which he has himself insisted, of carrying out similar inquiries into other fields of research. The conclusion at variance with that of the distinguished professor whom I have mentioned, is, that inflammation of the Peyerian glands is not limited to the two diseases in which only he has observed them; namely, the particular form of fever of which he has treated, and phthisis. A similar remark may be made with regard to the limits of age within which the inflammation of these glands is met with. Scarlet fever, we know, may attack very young children, and also old persons; and we have no reason to doubt that the combination of which I have been speaking may occur in these cases. Moreover, I have met with an exceedingly well-marked case of inflammation of these glands which were greatly enlarged, and in some instances partially, in a state of sloughing, in the body of a little girl who had died, not from scarlet fever, nor of the ordinary symptoms of common continued fever, but after a much more lingering malady, terminating in an acute attack, in which profuse hæmorrhage from the bowels was the most remarkable symptom*.

Of the ages
at which the
Peyerian
glands are
found af-
fected.

* Many similar cases are mentioned by Dr. Hewett, Professor Albers, and others.

I have been somewhat digressing from the subject to which I would specially invite your attention: but I have been led aside in quest of illustrations which I trust have rendered my meaning more intelligible and precise; and I hope I have convinced you, that the symptoms of fever, and more particularly those that unite to confer the character of typhus, are not necessarily connected with the derangement of a particular texture at a particular part of the alimentary canal; but that, besides a set of symptoms essentially connected with the functions and sympathies of a particular part, there are symptoms of another class, dependent on the nature of the morbid change which has been induced, and bearing no relation to its situation and sympathies, although they may receive very important modifications from these influences. This palpable truth appears to be fatal to the Broussaian doctrines; which, when pushed to the extreme in all their simplicity, would seem to reduce disease to irritation; and irritation to one genus, possessing one species, and having no other variety than that of degree. Hence the idea of specific diseases was particularly offensive to the disciples of Broussais' school. It is not my intention at present to enter into the consideration of the diseases which we seem to be warranted in regarding as possessed of these characters; but I shall merely observe, that whilst they give confirmation to the views I have been offering, these views, on the other hand, seem to throw light on their character, and to offer important considerations regarding their treatment. We may be led by them to reflect on the importance of appreciating the character as well as the situation of the primary affection, seeing that the general symptoms affecting the system are determined by both these causes. In cases in which the primary local affection comes under our inspection, as in those of hospital gangrene and sloughing cynanche maligna, the best-directed general treatment might be rendered altogether ineffectual, unless conjoined with appropriate local applications, which, for the

Remarks on
the preced-
ing subject.

Illustrations.

most part, are those of great energy, and calculated to arrest or change the morbid process; such as, nitric acid, lunar caustic, chloride of lime, and even arsenic. The existence of peculiar and distinct morbid changes, in opposition to the unity of irritation, appears to be proved, not merely by the varieties which we perceive in the character and duration of the general symptoms, but also by the production of other local affections having more or less of the character of the primary one. Thus, in the worst form of disease of the aggregate glands, in which their sloughing takes place, we not only find sloughing of the back and hips where pressure contributes to produce the effect, but also gangrene of the lungs. In a remarkable case of acute disease, which appeared to be brought on by excessive muscular exertion, in which extravasation of blood and diffused unhealthy suppuration took place in the muscles first affected, smaller depositions, partaking of the same character, were formed in different parts of the body; and there was strong reason to suspect that a morbid poison was produced, and conveyed to other persons in whom somewhat similar symptoms were generated. Similar observations may be made with regard to other local affections produced by accidental causes. Local violence, or previous disorganisation from disease, may set up local inflammation productive of suppuration attended with the most serious general symptoms; whilst the seat of the primary affection is so obscured, that phrenitis, carditis, or latent phlebitis, may be suspected, until the production of pus, in some form or other, in a conspicuous situation, throw some light on the character of the affection. Even then, the seat and cause of the primary affection may be only discoverable by post-mortem inspection. Thus I have been led to suspect the existence of some purulent deposit, from observing, scattered on remote parts of the body, very small collections of purulent fluid, which might be described as phlyctenæ filled with pus, or as ecchymatous pustules without sur-

rounding inflammation. The secondary morbid phænomena are apt to resemble the primary, in their acute or chronic character, as well as in the nature of the morbid process which is set up. Thus I have known a protracted case of gangrene of the lungs take place where the disposition to partial death commenced in necrosis connected with disease of the antrum. Malignant disease in one part of the body contaminates the system, and leads to malignant growths in other parts, presenting characters often resembling those exhibited in the primary seat.

These considerations lead to the subject of the inoculation of disease; and set before us a wide field for interesting inquiry, which has not yet been sufficiently attended to. Upon this subject, however, it is not my intention to enter at the present time. Inoculation.

If the original and primary sore be competent to affect the system, and cause the production of other local affections resembling itself, and set up a train of other symptoms more or less peculiar, it should cease to be surprising that we should have occasion to observe a variety of symptoms induced by the different affections of a particular part: and the fact that we do so, seems strongly to militate against the theory of the unity of irritation, which, let the disease be what it may, differs only in degree, in all cases. The most important inferences may be drawn from the fact to which I have alluded. If different causes produce the local affection, and, with it, different remote symptoms, it is perfectly consistent that different medicinal agents should be employed to counteract the different symptoms, whether primary or secondary. The success of one means, after others have failed, gives a further confirmation to this view; and must convince the *eclectic* practitioner that he has something more to do than arrive at an accurate diagnosis as to the seat of disease, and employ local depletion by leeches or other means, and push the limitation of diet to total abstinence. It is to the decided advantage which may be Theory applied to practice.

Successful practitioners.

obtained by recognising the character of the remoter general symptoms produced by local disease that we must refer the signal success of some individuals who are by no means particularly skilful in arriving at a diagnosis respecting the seat of obscure disease. Whilst, then, we may cease to wonder at the success even of empirics, when we see them cure patients and acquire unmerited confidence, we shall also learn to value that practical tact and discrimination which can alone be acquired by the frequent careful exercise of observation and judgment amongst cases sufficiently numerous and various. When the remote symptoms have been recognised and relieved, and when the particular state of the system generally has been appreciated, and appropriate means for its relief have been employed, the primary local affection, whether its actual seat may have been detected or not, may, in many cases, participate in the general improvement; and the return to health not only rewards the well-employed tact of the good practical observer, but obtains for him a reputation for superior knowledge of a disease, of the true pathology of which he may be ignorant.—You must not suppose that I am endeavouring to advocate the cause of this ignorance, and to depreciate accurate diagnosis; being firmly persuaded that this discrimination may be regarded as the corner-stone in the foundation of medical science; and that without it, the possessor of the most consummate practical tact, in reference to general symptoms, must often be disappointed in the results of his treatment, and deceived in his prognosis. Whilst the nature as well as the situation of a local affection exerts an important influence in affecting the whole system, it is equally certain that the appearances of a particular part, whether it be the seat of the primary or secondary affection, may become the index of the state of the system, whether it be stationary, advancing, or deteriorating. Thus, we not merely look at the tongue, the gums, the conjunctiva, and the skin, but we attend to the condition of some local derangement, which may be so

Local ap-
pearances
the indices
of the gene-
ral state

situated as to admit of our inspection; and we may, at times, derive the most gratifying conviction that an auspicious change has taken place in the system of our patient, from a very small spot of abraded surface. On the other hand, the simultaneous relapse of a number of patients, evinced by the unfavourable change in their local affections, however the situation and nature of these may differ, is an equally positive evidence of the existence of some prevailing deleterious influence, unconnected with the locality of the primary affections. I should too long extend this digression, were I to enter into various considerations to which the observations which I have offered would readily lead; yet I cannot omit to state my conviction, that a most important advance in our practical knowledge would be made, could we recognise certain states of the system often associated with local disease, but more intimately connected with its molecular changes than with its locality. I shall not attempt minutely to describe these states, but merely mention a few, by way of illustration, and as a stimulus to research.

Remarks on the different modes of treatment applicable to the plastic and to the non-plastic forms of inflammation.

In the first place, we may observe acute local inflammation marked with heat, pain, and throbbing of the affected part, when the general symptoms are such as characterize a high degree of inflammatory fever. No hesitation is felt to employ blood-letting largely, and often by different means; and to these the other remedial measures are accessory and subordinate. The success of this treatment, in the cases to which it applies, has not only led, in some cases, to an exaggeration of its importance, and to an excess in the abstraction of blood, but it has doubtless favoured the employment of bleeding in cases in which a form of inflammation has existed, in which this does not appear to be the proper remedy. In a form of inflammation closely allied, if not identical, with that which I have been noticing, the wish to dispense with very copious bleedings for the purpose of arresting the local inflammation has induced the employment of another mode of treatment, which has been found

to check the inflammatory state; and, above all, the deposition of lymph, which in some of these cases—as, for example, where the eye is concerned—is likely to be fatal to the organ, though not to the life of the patient. In such cases, I need not tell you that the rapid and liberal employment of mercury is a most efficient and invaluable mode of treatment. Success in these cases is calculated to inspire a fondness for the employment of these two most powerful agents, for the counteraction of inflammation; and with these auxiliaries we may attempt to oppose another form of inflammation, in which they may not only fail to succeed, but may positively do mischief. For example, the case may be one of inflammation of a serous membrane; as of the peritoneum. A large bleeding fails to relieve the oppressed pulse and anxious countenance;—leeches are applied when the further use of the lancet seems inadmissible;—still, no advantage is gained; and, as time is most precious in these cases, the greatest assiduity is exerted to throw in mercury, and “touch the mouth,” as the phrase is. This is done to alter the action, as it is said; but it may happen, that the action of mercury may co-operate with, and not counteract, that of the disease: and this I believe to be positively the state of the case in those forms of inflammation in which the product of the inflammation is of the non-plastic character. It is difficult to distinguish the plastic and non-plastic forms of inflammation during life; and whilst we have the two powerful agents which I have mentioned, with which effectually, though not always successfully, to combat the plastic form of inflammation, we are neither so effectually nor so certainly armed against the non-plastic: but it is well to be aware, that both the agents which avail in the former case, appear to be injurious in the latter. From the marked success which has attended the use of oil of turpentine in some of the worst cases of puerperal peritonitis, which is apt to be of the non-plastic form, I am led to suspect that this agent, and others resembling it more or

less in their mode of operation, form a class which would be suited to the treatment of the non-plastic form of inflammation, were a correct diagnosis of its existence to be arrived at. The influence which turpentine exerts in hæmorrhage from the lungs and other organs, and its known diffusable properties, seem to give some support to this conjecture.

I trust that I have said enough to enable you to perceive the scope and tendency of the remarks which I have offered to your consideration: and shall merely suggest their application to the employment of some other remedial agents; such as, bark, musk, opium, and wine, of which the *modus operandi*, as well as the value, may be variously regarded.

ARTICLE XXIV.

ON THE COMPOSITION OF SECRETIONS, AND THE ORGANS PRODUCING THEM.

AIM OF THIS INQUIRY—REMARK RESPECTING THE RELATION BETWEEN CHEMISTRY AND VITAL PROCESSES—MOLECULAR CHANGES—REJECTED MATERIALS CARRIED OFF BY VEINS, LYMPHATICS, AND EXCRETORY DUCTS—MOST READILY SOUGHT IN EXCRETIONS—FACTS SUPPORTING THIS OPINION—PUS FROM PARTICULAR PARTS—PECULIAR ODOUR OF ANIMALS.—GENERAL--LOCAL--SEROUS SECRETION—THENARD'S VIEW OF SECRETION—CATALYTIC ACTION OF BERZELIUS—INFLUENCE OF NEIGHBOURING PARTS--ILLUSTRATED IN THE CASE OF BONY MATTER—MALIGNANT TUMORS—BLACK PIGMENT—ANATOMICAL CHARACTERS OF SECRETORY ORGANS—CHANGES EFFECTED IN SECRETIONS AFTER THEY HAVE BEEN POURED OUT—CHANGES EFFECTED IN DEAD AND INORGANIC MATTER—FORMATION OF ADIPOCERE—CHANGES IN FRUITS--IN LEAVES—STARCH AND GUM—TIME AND ELEMENT TO BE REGARDED—MUCUS—MILK-PUS—SECRETION IN SEBACEOUS FOLLICLES—FAT IN THE FETAL STATE—FATTY MATTER FOUND WITH HAIR IN THE OVARIA—FATTY DEGENERATION OF TISSUES, *e.g.* OF CONTRACTILE FIBROUS STRUCTURE—OF THE LIVER—DIFFERENCE BETWEEN TISSUES IN THEIR HEALTHY AND IMPAIRED STATES—REMARK RESPECTING EXPERIMENTS ON IMBIBITION—INFLAMMATION NOT A STATE OF EXALTED VITALITY.

[The following pages, though not composed as a Lecture, but as part of a Communication to the British Association for the Advancement of Science, bear so closely on some of the views advanced in the last Lecture, that I have thought it expedient to reprint them in this place. I shall be gratified, should they induce any original inquirer to investigate some vital phænomena exhibited in health and disease by modes hitherto unemployed, and by which some interesting and possibly important conclusions may be drawn. I had indulged the hope, that, in connection with the Institution in which the preceding Lectures were delivered, I might have had the opportunity of pursuing some of these inquiries myself; but circumstances, to which it is not my desire to do more than allude, having blasted those hopes, I am additionally anxious to recommend the inquiry to more favoured individuals.—See the *Report of the Seventh Meeting of the British Association for the Advancement of Science*, p. 139.]

THE Committee appointed by the Medical Section of the British Association, to investigate the chemical composition of glands and their respective secretions, have been prevented by different circumstances (amongst which have

been the lamented death of one of their number, and the disturbed health of another) from rendering a complete report on the subject referred to them. They are desirous, however, of making such a statement of their progress, as may invite the co-operation of animal chemists in the extensive and somewhat difficult field in which they find themselves engaged.

The manifest object of the investigation proposed to your Committee has been, to obtain, through the medium of animal chemistry in its present improved state, some further insight into the mysterious and vital process of secretion.

Aim of this inquiry.

The terms in which this inquiry is proposed, seem to give to it a particular direction, the reason for which may not be very obvious: and as they were suggested by one of your Committee, it may not be amiss to assign here the reasons which occasioned this course to be pointed out. Before proceeding to do so, we will offer one remark, in opposition to a generally-received opinion respecting the process of secretion. It seems to be considered, that inasmuch as this process is one in which vitality is concerned, it is removed from the province of chemistry. From this opinion we totally dissent; seeing that, whatever changes are produced in the proportion and mode of combination of the elements of which bodies are composed, must, when not merely mechanical, be essentially chemical; and that the introduction of an agent, though it be no less important than the influence of life, does not in any degree detract from its chemical character. We have merely to consider, that the elements both act, and are acted upon, under peculiar circumstances, which offer some analogy to what is seen when chemical elements are exposed to the influence of caloric or electricity: their inherent properties are not destroyed, but they are modified when they are placed under these influences: and, as the investigation of chemical changes, in which the two influences just mentioned are concerned, has tended greatly to improve our know-

Remark respecting the relation between chemistry and vital processes.

Molecular
changes.

Rejected
materials
carried off
by veins,
lymphatics,
and excre-
tory ducts.

Most readily
sought in
excretions.

ledge in respect to them, so we may reasonably hope that a similar result may be obtained from the investigation of the processes of nutrition and secretion going forward in living bodies, by regarding them as strictly chemical, even in those very modifications which vitality produces. When it is considered, that during the activity of life the process of nutrition is constantly maintaining, even in the solid parts of animal bodies, molecular changes, by which old materials are removed and new ones deposited, we must be led to presume, *à priori*, that, as the rejected particles are taken away in a state of perfect solution, they must find their way into those fluids which proceed from the particular part. In ordinary textures (by which we wish to be understood, those which are not called glandular) we feel no hesitation in admitting, that the rejected particles are carried away in the lymph and venous blood; but in glandular structures, and in parts which, like them, yield a peculiar secretion, as well as return lymph and venous blood to the system, we have a third course, into which some of the rejected particles may be expected to find their way. Now, though it may be difficult, or almost impossible, to detect, either in the venous blood or the lymph, any peculiarities which the addition of the rejected particles may give to the venous blood and lymph proceeding from particular parts, the case may be different when we investigate a particular secretion, in which it seems probable that these particles may exist in a larger proportion, having a less admixture of the whole or some of the constituents of the general circulating fluid. The manifest properties of some secretions seem to lead to a similar conclusion *à posteriori*. The varieties which we find in pus produced in different parts of the body are among the most palpable examples of this kind. Pus from the brain has a peculiar consistence and colour, resembling greenish cream, even where there has been no breaking down of the substance of the brain, by which that material might be grossly blended with it. When

pus is formed in the immediate neighbourhood of the alimentary canal, and especially of the lower part of it, it possesses so strongly the fæcal odour, that it has been confidently believed that fæces had been mixed with it, until the absolute impossibility of such an occurrence had been demonstrated. Pus formed in the immediate neighbourhood of the toes possesses the peculiar odour of those parts; and a similar remark sometimes applies to matter formed in the axillæ.

Facts supporting this opinion.

Pus from particular parts.

The peculiar odour exhaled by different species of animals, and even by different individuals of the same species, dependent on difference of age and sex, appears to be another illustration of the principle which has been here suggested: for although such peculiar odour may in some instances be referred to a special local secretion, as in the instances of the civet-cat and musk-deer, it cannot have escaped the observation of those who have been in the habit of dissecting the bodies of recently-killed animals of different species, that there exhales not from one part only, but from every part, internal as well as external, modified indeed by circumstances, a peculiar smell which is characteristic, and belongs both to the solids and fluids.

Peculiar odour of animals.

General.

Local.

Another illustration of the influence of the character of parts upon the secretion which they produce may be seen about the mouth, where a slight excoriation or sore is apt to produce a considerable quantity of thin fluid secretion, which one can scarcely fail to regard in conjunction with that secretion which is poured into the mouth from the internal surface of those parts. The copious secretion from a blistered surface, when the subcutaneous cellular membrane is œdematous, is perhaps a phænomenon of the same character.

Serous secretion.

The chemical composition of secreting organs may influence that of their products independently of the particles which they may absolutely impart from their own structure. It may do so by a process similar to that which Thenard

Thenard's
view of se-
cretion.

Catalytic
action of
Berzelius.

Influence of
neighbour-
ing parts.

Illustrated
in the case
of bony
matter.

Malignant
tumors.

has pointed out, as taking place when deutoxide of hydrogen comes in contact with fibrin; a process which that great chemist several years since pointed out, as likely to throw light on the function of secretion. This idea has since been developed by Berzelius; who calls their action of contact the catalytic action; and argues, that probably the contact of the blood with certain surfaces of the organs may produce some alteration in the arrangement of elements, and that the secretions may be thus catalytically formed from the blood.

It is probably to the operation of this principle that we may ascribe some phænomena, which, in addition to the circumstances which have already been mentioned, render it desirable to ascertain with accuracy the composition of solid parts in conjunction with that of their secretions. In some healthy, and in not a few morbid actions, we see that a new product, whether fluid or solid, is very much influenced by the character of the surrounding parts. Thus, in the condensed cellular membrane in the neighbourhood of bone, it sometimes happens that masses of bony matter are deposited, but are perfectly detached. The numerous instances which we see of ossification at the origins or insertions of muscles are probably referable to the same principle; although it must be admitted that these examples are not unexceptionable, since in them we have a continuity of structure. As a further illustration, it may be noticed, that after the fracture of a bone, the process by which the new bony matter necessary for union is produced, is often morbidly carried on in the matters which inflammation has deposited in the surrounding structures. The most striking illustrations are undoubtedly those which are presented by the heterologue structures, probably because of their being much more readily produced accidentally than the analogue. Thus we see that the natural structures in the neighbourhood of malignant tumors are apt to degenerate into a substance in some respects resembling that of

the original tumor. In the neighbourhood of those tumors which are of slow growth and of cartilaginous hardness, we often find the surrounding structures, but more especially the cellular membrane, partaking of the same character of hardness, though necessarily wanting the structural arrangement which characterizes the tumor itself: in the same way that we find that those tumors which are composed of a soft and brain-like substance are surrounded by natural structures, which degeneration has converted into nearly a similar substance, or which have a similar matter deposited interstitially. Again, in those tumors which are remarkable for their black colour, and to which the name of melanosis has from this circumstance been applied, the surrounding structures become more or less deeply tinged with a black or dark-coloured material. This disease also presents us with a good illustration of the principle, in a mode precisely the converse of the preceding example. There is, perhaps, no organ so liable to be affected with melanosis as the eye; and it may not unreasonably be suspected that it is the natural and healthy production of black pigment, performed by the choroid coat of this organ, which is the chief cause of this predisposition.

Black pigment.

The anatomical structure of a secreting organ is one of the conditions which it is essential to consider, in an inquiry into the phenomena of secretion; although it cannot be imagined that they are affected by any merely mechanical separation. If it were possible, it would be desirable to ascertain, and to indicate by definite terms, the comparative degrees of vascularity, the proportion in which the ramifications of the three vascular systems are combined, and the rapidity of circulation. The comparative innervation of the part, although probably no less important, is perhaps still less exactly ascertained. To improve our knowledge on this point, it would be particularly desirable to ascertain not merely the number of nerves sent in proportion to the size of the organ, but also their origin, and the proportion

Anatomical characters of secretory organs.

in which they are derived from the ganglionic and cerebro-spinal systems,—the degree of sensibility which they impart to the organ,—the degree of uniformity or variation of function which may be observed in the organ,—and the conditions by which it may be influenced in this respect; also, whether the nutrition resulting from the combined action of the vascular and nervous systems is steady, or subjected to periodical or other variations.

Although we are at present very much in the dark upon most of these subjects, we may be convinced, from various examples, that the characters of a secretion are influenced by the texture of the organ which produces it. In those adventitious cysts which are liable to be formed in different parts of the body, but which are most frequent as well as most distinctly formed in the ovaria, and in their vicinity, we find, that whilst they are of a thin and delicate texture the secretion is thin and aqueous or serous; but that when they have become a little thickened, their secretion is thick, viscid, and mucous or albuminous. A similar transition, but in a less-marked degree, may be seen in the serous membranes natural to the body, and also in the mucous membranes. Where these are thin and delicate, as in the case of the conjunctiva, and in the extreme branches of the bronchial tubes, their secretion approaches very closely to that of the serous membranes, whilst the thicker membranes which line the various portions of the alimentary canal produce large quantities of mucus. When chronic inflammation has thickened these membranes, the quantity and viscosity of the mucus produced is notoriously increased.

Changes
effected in
secretions
after they
have been
poured out.

In investigating the causes which operate in the production of animal secretions, there are doubtless several points to be considered, besides the chemical composition and anatomical structure of the parts producing them, and the composition of the fluid from which they are derived. Even after the secretion has been poured forth from the living solid, it is certain that it undergoes important changes, by

which its character is in many respects altered. Although these changes are in part to be ascribed to the material remaining under the influence of the living structure by which it is surrounded, and which may act both by abstraction and addition, nevertheless there are some modifications more immediately depending on the inorganized secretion itself. Such changes seem to be more particularly within the undisputed limits of animal chemistry in its present state; and we may reasonably expect to find their parallels or analogues in the changes which take place in dead matter apart from the living body. While some of these changes are undoubtedly brought about by the influence of air and moisture, by which the addition or subtraction of elements may be effected, in other instances the change seems to be more particularly brought about by alteration in the arrangement of the previously-existing elements.

Amongst the changes taking place under one or other of these conditions in organic or dead matter, and wholly removed from the influence of life,—and to which some parallels may probably be found in changes effected within the living body,—the following examples may be pointed out, by way of illustration. None are more notorious and familiar than those which take place in wine and other fermented liquors, when kept in well-closed bottles. In some of these instances, it may be said that the change is only mechanical, and the result of very slow deposition; yet there are, unquestionably, cases in which no deposition takes place; and the change, be it what it may, is undoubtedly effected in the chemical combination of the ultimate elements. Between these extremes there are mixed cases, as when crystals are deposited and gases liberated to occupy the upper part of the containing vessel. Amongst the long-neglected bottles which may sometimes be seen in a chemist's laboratory, we may occasionally observe the results of very slowly-effected changes in the combination

Changes
effected in
dead and
inorganic
matter.

of the enclosed elements exhibited in remarkable precipitates and in alteration in colour.

In the mineral kingdom, and more especially in rocks of volcanic origin and possessing a cellular character, we may observe the most remarkable transfer and chemical combination of elements in the products, often beautifully crystallized, by which the cavities become more or less filled, notwithstanding the firm and apparently impenetrable character which the rock may possess. Amber may be adduced as another example furnished by the mineral kingdom; for it is doubtless whilst appertaining to this class that it has received the characteristics which distinguish it from the recent resins, to which it is not only closely allied, but from which it is in all probability really derived. In this instance we have a material as impervious to water as the volcanic rocks before mentioned. But the obvious change produced is in some respects different. Instead of a new substance, separated in distinct portions, the result of a transfer to sensible distances, we find an uniform change of substance throughout. There is, perhaps, no change in dead matter which is more interesting, from its relation to the subject before us, than the conversion of all the soft parts of animals into the peculiar fatty substance called adipocere; which takes place under exposure to certain circumstances, of which immersion in moisture appears to be the most important. It is worthy of note, that this change seems to take place nearly alike in different textures; such as, skin, muscle, cellular membrane, and adipose substance: yet, as it can hardly be supposed that they are all equally prone to it, it seems probable that its having commenced in one tissue tends to determine its taking place in others in contact with it.

Formation
of adipocere.

As a collecting link between changes resembling those just adduced, and those which occur in living organized bodies, may be mentioned the well-known fact, that many fruits gathered long before their living connection with the

Changes in
fruit,

root would have naturally ceased, undergo, notwithstanding, those changes which render them ripe, or, in other words, bring them to a state of maturity. In the leaves of plants, a short time before they lose their connection with the branch, and also when they have been detached from it, a chemical change takes, place, which produces the xanthophylle or yellow-colouring principle on which the hues of autumn in great measure depend. Before we can apply the principle of these changes to the assistance of our investigation of the changes effected in living bodies, it is important that the laws which regulate them should be further elucidated. The labours of some of our continental chemical brethren have already considerably advanced the subject. Without swelling this preliminary report with an analysis of what they have done, it will be sufficient for our present purpose to adduce, without attempting any chemical explanation, some of the apparently parallel phænomena to which we invite the attention of those who may be disposed to co-operate in this kind of research. As farina or starch may be converted into gum, and both farina and gum into sugar—and these into various acids, or into alcohol or æther—so it would appear that other principles may be changed according to a particular course of succession, though some of the possible links may not be always essential. The very possibility of such successive changes renders it necessary to take into consideration another element, viz. *time*; and in our inquiry into the production of different secretions, we must, besides investigating the anatomical and chemical composition of the secreting organ, and the qualities of the matter when first produced, as compared with its ultimate state, likewise not fail to take *time* into the consideration. The first rapidly-produced secretion from a mucous surface is nearly serous. Newly and rapidly-formed mucus is thin and aqueous, when compared with that which has been long detained upon the surface of the secreting membrane. When milk is too frequently drawn from the

and in
leaves.

Starch and
gum.

Time, an
element to
be regarded.

Mucus.

Milk.

lactiferous glands, it is thin and watery, compared with that which is allowed to be longer retained. The production of pus is another example, and one in which the changes may be followed by the eye through their whole course. When pus has been well removed from a suppurating surface, its place is soon supplied by a thin and watery secretion. This afterwards becomes viscid, but without being visibly particled : it afterwards becomes manifestly particled and turbid ; and, ultimately, thick, opaque, and cream-like. There are perhaps no secretions which are more interesting than those in which a fatty or resinous matter is produced. They may be compared to the production of oily matter in living vegetables, and to the conversion into adipocere in dead animal matter. The most recently-produced secretion of a sebaceous follicle is nearly or quite aqueous ; but it soon appears to be albuminous or caseous, and does not appear to possess any oleaginous property. This it soon after acquires, when it becomes the natural unguent to the skin. When the secretion fails to escape, it accumulates, and a collection of grumous fatty matter is formed. In the early embryo, the situation of the adipose substance is occupied by small grains of an opaque whitish substance, which appears to be rather albuminous or caseous than truly adipose. The production of cream in the lactiferous glands, when the milk is allowed to be well formed, appears to be another physiological instance. The next is of a pathological character. It is well known, that in or near the ovaria, it occasionally happens that encysted masses are found, containing fat, bone, teeth, and hair. Although the whole of these materials are not necessarily found in the same specimen, fatty matter appears to be invariably present. These extraordinary productions are generally referred to conception ; and are indisputably closely allied to, if not identical with it. Now, in the natural ovum but a comparatively small portion of fatty matter exists, and certainly none in the situation in which the peculiar fatty matter,

Pus.

Secretion in
sebaceous
follicles.Fat in the
foetal state.Fatty mat-
ter found
with hair in
the ovaria.

which forms so large a portion of these encysted formations, is met with. It would therefore appear, that when growth, as well as development, has been suspended in these irregular efforts of the *nisus formativus*, there commences a conversion of the collected elements into a fatty substance, by the introduction of a new chemical arrangement of the elements. Even this change is progressive; and it would appear that the fatty matter, when formed, is susceptible of further change; for, in some of these collections, the fatty matter appears clean, nearly white, and uniform; in others, it approaches the character of cholesterine; and in one instance we have met with it having a bright yellow colour, and a strong, penetrating, empyreumatic, or bituminous odour, bearing considerable resemblance to an unctuous yellow substance found as a mineral production in Scotland some few years since, and placed in the possession of Professor Jameson. Next to these changes taking place in the living body, yet probably, except in the case of foetal fat, beyond the limits of organization, it may, perhaps, be allowable to place the pathological degeneration of some tissues into fat. The muscles of the limbs, and the contractile fibrous coat of an enlarged and thickened bladder, have been found converted into this substance. The most frequent, as well as the most remarkable of these fatty degenerations, is the production of fat livers, which has attracted the special notice of some foreign pathologists. It is comparatively rare in this country; and but few very well-marked instances have been met with amongst many hundred inspections performed, during several years, at Guy's Hospital; yet changes, which appeared to be approaches to it, have not been very rare. This degeneration essentially belongs to the acini; which are generally, if not invariably, enlarged in size, paler, and less supplied with blood than in the healthy state, and have nearly or wholly lost their power of secreting bile. In the advanced cases, the specific gravity of the liver becomes less than that of water,

Fatty degeneration of tissues; *e. g.* of contractile fibrous structure,

of the liver.

and fatty matter forms by far the largest part of its composition; whilst in other cases, in which this degeneration has taken place, fat has only formed a small per-centage. Now, it is not very uncommon to find in cachectic patients, who have long been unable to take exercise, a considerably enlarged liver, dependent on the great hypertrophy of the acini; which, though wanting the essential characteristics of the fatty degeneration, are paler and more homogeneous than in the healthy liver, and have more or less lost the power of producing bile. It is, perhaps, not too wild a speculation, to imagine, that in this impaired condition of the organ it may not be able to resist the tendency to those changes which inorganized animal-matter undergoes when placed in circumstances favourable to their production. This leads us to another remark, applicable to other cases; and which seems to reconcile the speculations which we have allowed ourselves to offer with facts which will doubtless be readily admitted.

Difference
between tis-
sues in their
healthy and
impaired
state.

The different tissues, while they retain their healthy condition unimpaired, resist these common tendencies more or less forcibly, and apparently each in a peculiar manner; and they are consequently enabled to maintain their own peculiar composition, notwithstanding the incessant molecular changes effected by nutrition: and where they happen to be secreting organs, the same uniformity is preserved in their products. But when they are impaired by disease or accident, this isolating faculty is injured or lost. Thus in the experiments of Majendie, Fœdera, Segellas, Meyer, Tiedemann and Gmelin, and others, with reference to absorption, transudation, and imbibition, we meet with some results, obtained in the injured bodies of animals employed in these inquiries, which are not perfectly similar to those phænomena which may be observed when the corresponding organs of perfectly healthy and vigorous animals are concerned; fluids possessing various properties being seen to enter into the circulation, and to penetrate membranous

Remarks
respecting
experi-
ments on
imbibition.

and other textures in the experiments alluded to, whilst in the latter case they meet with impassable barriers. The diffusion of a diseased process, as in the instances of the degeneration of structures in the vicinity of malignant tumors, alluded to in Vol. I. p. 260, does not appear to take place until these structures have been impaired by inflammation; when the new product, to which this disturbance of function gives rise, presents the character possessed by the adventitious structure. This view of the case, if correct, tends to strengthen our opinion, that inflammation is not to be regarded, as some have supposed, as a condition of exalted vitality, but quite the reverse. It also directs us, in our inquiry after the chemical attributes of vitality, to fix upon the precise attractions which it is engaged in counter-acting.

Inflamma-
tion not a
state of
exalted
vitality.

END OF THE FIRST PART

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